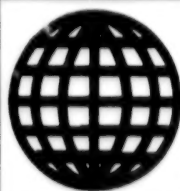


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DNA Fingerprinting in Four Cattle Breeds Using (CAC) ₅ Microsatellite Probe [T. Raudsepp, T. Lushnikova, et al; Tallinn IZVESTIYA AKADEMII NAUK ESTONII Vol 43 No 3, Jun-Aug 94]	70
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Debate on Proposed Svobodnyy Cosmodrome Outlined

957A0322A Paris AIR & COSMOS/AVIATION
INTERNATIONAL in French No. 1501, 13 Jan 95 p 35

[Article by Christian Lardier and Serge Berg: "Debate over Svobodnyy Cosmodrome"]

[FBIS Translated Text] The proposal to build a new Siberian cosmodrome is supported only by the space forces and the military-industrial complex. The final decision is in the hands of President Yeltsin and the government...

Russia, which has only one cosmodrome on its own territory (the Plesetsk base in the north), is considering plans to build a new launch complex at Svobodnyy, in the Far East, as a long-term replacement for the Baykonur cosmodrome it now leases from Kazakhstan for the modest sum of \$115 million (632 million francs [Fr]) per year. According to Viatcheslav Bezborodov, chief of the space forces operational directorate, maintenance on Baykonur had cost the space forces \$190 million (Fr1 billion), and the space agency (RKA) \$170 million (Fr935 million). This base, situated at 46° N., is used for manned flights, launches of geostationary satellites, and a few low-orbit satellites (seven Tsiklon, Soyuz, and Zenit rockets in 1994). Over the next few years, launches of foreign satellites from Baykonur (nine geostationary and three in low orbit) will bring Russia revenues of \$650 million (Fr3.5 billion).

But these operations cannot be conducted from Plesetsk, which is situated at 63° N. So the space forces have chosen the Svobodny-18 military base as the site for the launch complex of the future Angara launcher (successor to Proton). At 51.37° N., it was chosen over a site near Vladivostok (44.5° N.) and another site in the Khabarovsk region (49° N.). Infrastructure at the base, the home of about five dozen strategic ballistic missile silos for the UR-100 alias 8K84 (alias SS-11 in NATO parlance), is valued at 390 billion rubles [R] (Fr611 million). The space forces have estimated that construction of the cosmodrome between now and the year 2010 will cost R2.5 trillion (Fr4 billion) at January 1994 prices. It could support the new Rokot light launcher beginning in 1996 and the Angara-24 launcher by about the year 2000. Installation of the Angara launch complex at Plesetsk would take a minimum of 8 to 10 years. Also, creation of a universal platform for rockets of different types at Plesetsk would cost an estimated R2-3 trillion. This means it would cost as much as the Svobodnyy project, which however the RKA seems not to want.

An article published on 27 December by two KOMSOMOLSKAYA PRAVDA journalists (Nikolai Savin and Serge Plujnikov) is highly critical. It denounces this "ruinous plan," which RKA estimates will cost R4 trillion, and enumerates negative arguments such as pollution from the fallback to earth of rocket first stages, the seismic instability of the region, its remoteness, the

difficulties of transporting enormous loads through the numerous trans-Siberian tunnels, the proximity of China (barely 100 km away), etc. The article refers numerous times to the report prepared in early 1994 by the Russian Federation Security Council working group headed by Nikolai Laverov, vice president of the Academy of Sciences. Recently, they [i.e., the journalists] write in conclusion, the Defense Committee of the Duma (parliament) has come out against the proposal, but this fact did not prevent General Alexandre Vinnidiktov, commander of the Svobodnyy 18 base, from stating publicly that a decision to finance it will be made by President Yeltsin and the cabinet. They add that the plan is supported by a powerful "lobby" with close ties to the government. The project's only supporters are the military-industrial complex and the current deputy prime minister, Vladimir Polevanov, who while administrative chief of the Amur region made no effort to conceal his bias in favor of building the Siberian cosmodrome.

Schedule of Russian Spaceflights in 1993-1994 Detailed

957A0322B Paris AIR & COSMOS/AVIATION
INTERNATIONAL in French No 1501, 13 Jan 95 p 37

[Article by Christian Lardier: "Russians Still Lead in Number of Launches"]

[FBIS Translated Text] Russia was responsible for 53 percent of all satellite launches in 1994, despite a 40 percent decline since 1990...

The year just concluded shows that the Russian space program is at last stabilizing, with activity for 1994 practically the same as the previous year. In 1993, Russia staged 48 launches, carrying 60 satellites into orbit, while last year there were 46 launches for a total of 62 satellites.

In 1994, 25 satellites were civilian (40 percent) and 37 were military (60 percent). In manned flight, three crew members joined the Mir space station: Dr. Valery Polyakov (a record 15 months in orbit), Helena Kondakova (women's record of 6 months), and Europe's Ulf Merbold (a 1-month flight). Fifteen applications satellites (telecommunications, meteorology, remote sensing, navigation, and geodesy) were launched in 1994, some of which were new (Gals, Express, Elektro, etc.). Only two were scientific satellites (Koronas-1 for the study of the sun and Foton-9 for microgravity research). The Cosmos military satellites were divided into several categories. Photo-reconnaissance uses the third-generation Kometa and Oblik (14 days in orbit), the fourth-generation Yantar-2K and 4K (60 days in orbit), and a fifth-generation digital transmission model (6 months in orbit) launched by Soyuz, as well as the sixth-generation Kuban lofted into orbit by a Zenit launcher. In telecommunications, the military have (1-ton) satellites carried by the Kosmos rocket, a constellation of small Gonetz launched in groups of six by

Tsiklon, and the Geyser geostationary satellites. Navigation assistance is provided by the (1-ton) Parus satellites carried by Kosmos, plus the constellation of Uragan (alias Glonass) launched in groups of three by Proton. In the missile-warning domain, there are the first-generation Oke carried by the Molnya, as well as the geostationary Prognoz satellites. Electronic intelligence is collected by third-generation satellites carried by Tsiklon and by fourth-generation satellites carried into orbit on the Zenit. The (Eorsat) oceanic surveillance satellites are the only ones to be carried into orbit by Cyclone from Baykonur. Finally, radar calibration satellites are put into orbit by Kosmos launched from Plesetsk, which serves as the launch site for 60 percent of the military satellites.

1994 Schedule

The Russian space program for 1994 involved seven types of launchers and 31 types of satellites.

In the 46 successful launches Russia conducted in 1994, seven types of launchers were used, with a very sharp augmentation in the number of Proton and Zenit rockets—twice as many as in 1993. By contrast, the number of Soyuz and Molnya rockets from the TsSKB of Samara (spinoffs of the Semyorka) declined markedly, from 25 to 17; during the 1980s, more than 50 a year had been launched. Only one launch failure was reported by Russia, when a Tsiklon rocket malfunctioned on 25 May. But this rocket has failed only five times in 122 launches, so it still has a 96 percent reliability record. A new light launcher, the Rokot, made its debut on 26 December. It can put a 1.5-ton payload into low orbit.

Table 1: Hit Parade of Russian Launchers

Rocket	1993	1994
Soyuz	17	14
Molnya	8	3
Kosmos	6	5
Tsiklon	8	7
Proton	6	12
Zenit	2	4
Start	1	0
Rokot	0	1
TOTAL	48	46

Table 2: Russian Launch Record 1990-1994

	1990	1991	1992	1993	1994
Successful launches	75	59	54	48	46
Satellites placed in orbit	96	83	75	60	62
Failures	Zenit	Zenit	Zenit	Proton	Tsiklon

Table 3: Russian Civilian Satellites 1993-1994

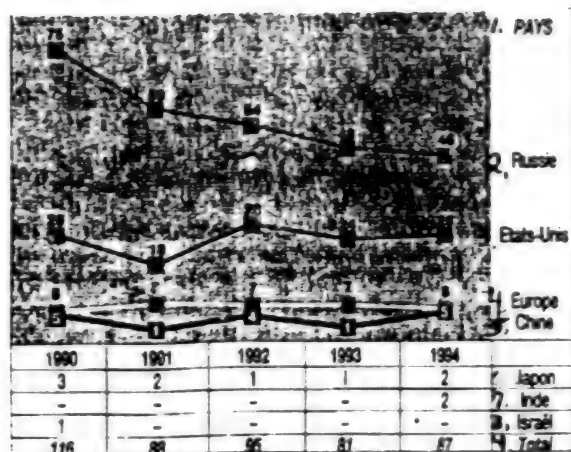
	1993	1994
Manned Flights		
Soyuz-TM/Progress-M	7	8
Telecommunications		
Molnya-1 and 3	5	2
Raduga/Gorizont/Altair	5	6
Gals/Express		
Courier	1	0
Radio-Rosto	0	1
Meteorology/Remote Detection		
Meteor-2 and 3	1	1
Resource-1	0	1
Resource-F	3	0

Table 3: Russian Civilian Satellites 1993-1994 (Continued)

	1993	1994
Okean-1	0	1
Elektro (Goms)	0	1
Navigation/Geodesy		
Nadezjda	0	1
Geo-IK	0	1
Microgravity		
Foton	0	1
Scientific		
Koronas-1	0	1

Table 4: Russian Military Satellites (Kosmos) 1993-1994

	1993	1994
Photo Reconnaissance		
3d-generation	3	3
4th-generation	3	2
5th-generation	1	0
6th-generation	0	1
Telecommunications		
Satellites on 74°	1	2
Satellites on 82.6°	12	12
Geyser (geostationary)	0	1
Navigation/Geodesy		
Parus (Tsikada network)	4	1
Uragan (Glonass network)	3	9
Early Warning		
Oko (12-hour orbit)	3	1
Prognoz (geostationary)	0	1
Electronic Intelligence Collection		
3d-generation on 82.5°	1	0
4th-generation on 71°	2	2
Ocean Surveillance		
Eorsat-type satellites	4	1
Radar Calibration		
Satellites on 66°	1	1



Trends in Number of Satellite Launches

Key: 1. Country—2. Russia—3. United States—4. Europe—5. China—6. Japan—7. India—8. Israel—9. Total

Volt-Ampere Characteristics of Structures With Tin δ -Doping of the Vicinal Edges of GaAs

957A0289A St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 28 Nov 94 (manuscript received 2 Sep 93; signed to press 10 May 94) pp 1889-1895

[Article by V.I. Kadushkin, V.A. Kulbatskiy, Ye.V. Bogdanov, A.P. Senichkin, Leonosov Moscow State University]

[FBIS Abstract] A method of obtaining two-dimensional electron gas in an i-GaAs matrix on GaAs(Cr) substrates developed in another paper is described. A system of steps is formed on the vicinal edges of a crystal, and the faces of these steps are decorated with atoms of an electrically active shallow donor dopant, in this case, tin. The inhomogeneous distribution of tin is preserved with a layer of GaAs grown at low epitaxy temperatures. Specific parameters are provided. Structures with tin δ -doping of the vicinal edges of GaAs are synthesized, GaAs(δ -Sn). For the first time, a two-dimensional electron system is obtained with high mobility values. The volt-ampere characteristics are analyzed at 300, 77, and 4.2 K in electric fields of up to 2000 V/cm. The dependence of current density and drift velocity on electric field strength is measured. The linear dependence of current density on the electric field to 2000 V/cm is due to the coexistence in GaAs(δ -Sn) structures of two-dimensional electrons and quasi-one-dimensional electron channels. GaAs(δ -Sn) structures are unique among

known quantum dimensional systems in that they suppress electron heating by effective interaction of two-dimensional and quasi-one-dimensional electrons with high energy dissipation rates. Quasi-one-dimensional electrons play the main role in energy dissipation. The existence of quasi-one-dimensional channels is confirmed in photoluminescence spectra. Figures 4, references 25: 11 Russian, 14 Western.

Electron Properties of Buffer GaAs Layers Obtained With MBE at a Growth Temperature of 360-640°C

957A0289B St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 28, Nov 94 (manuscript received 16 Mar 94; signed to press 10 May 94) pp 1937-1946

[Article by K.S. Zhuravlev, V.Ya. Prints, D.I. Lubyshev, B. R. Semyagin, V. P. Migal, A. M. Gilinskiy, Institute of Semiconductor Physics, Siberian Division, Russian Academy of Sciences, Novosibirsk]

[FBIS Abstract] This paper presents a detailed study of the electric and photo luminescent properties of undoped buffer GaAs layers grown with molecular beam epitaxy on semi-insulating GaAs substrates. A line in the photoluminescent spectrum with $(h/2\pi)\omega = 1.460$ eV is reported for the first time. Layers 1.5 μ m thick were grown in conditions which insured growth of a constant ratio of Ga and As concentrations corresponding to a (3x6) superstructure on the surface. Decreasing the growth temperature (T_g) leads to an increase in layer resistance. Layers obtained at $T_g < 480^\circ\text{C}$ are semi-insulating. The decrease in the concentration of holes as T_g decreases at $480 \leq T_g \leq 640^\circ\text{C}$ is mainly due to an increase in the concentration of deep donors of unknown origin. As temperature decreases further, $T_g < 480^\circ\text{C}$, the total concentration of donors does not vary (within the limits of experimental accuracy) and is 2×10^{15} to $6 \times 10^{15} \text{ cm}^{-3}$. At T_g around 480°C there is a switch from p-type conductivity to n-type conductivity due to an increase in the concentration of shallow donors relative to the concentration of shallow acceptors in low temperature layers as T_g decreases. Figures 6; references 25: 3 Russian, 22 Western.

Effect of Nonthermalized Electrons on the Photoconductivity of GaAs/AlGaAs Heterostructures at the Cyclotron Resonance

957A0289C St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 28 Nov 94 (manuscript received 5 Apr 94; signed to press 10 May 94) pp 1960-1964

[Article by N.A. Mordovets, I.N. Kotelnikov, Institute of Radio Engineering and Electronics, Russian Academy of Sciences, Moscow]

[FBIS Abstract] The dependence of photoconductivity on the magnetic field of GaAs/AlGaAs heterostructures with an altered concentration of two-dimensional electrons is measured when irradiated by a laser at 419 μm . The photoconductivity is studied at various levels of Landau level filling. The dependence of the transmission, magnetic resistance, photoresponse, and temperature sensitivity of the magnetic resistance on the magnetic field is studied. Comparison of the data with measurements of the temperature dependence of magnetic resistance made it possible to isolate the component of photoresistance associated with the contribution of nonthermalized excited electrons. There is a shift in the signal peak of this photoconductivity relative to the absorption peak (toward larger magnetic fields). The position and width of photoconductivity at cyclotron resonance in this range of magnetic fields is independent of the Landau level filling factor. Figures 2; references 8: 2 Russian, 6 Western.

Properties of Spectral Features of Powerful Injection Heterolasers Using Four-Component Solid InGaAsP Solutions

957A0289D St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 28 Nov 94 (manuscript received 22 Apr 94; signed to press 10 May 94) pp 1983-1990

[Article by N.A. Pikhmin, I.S. Tarasov, M.A. Ivanov, Ioffe Physicotechnical Institute, Russian Academy of Sciences, St. Petersburg]

[FBIS Abstract] This paper examines the spectra of spontaneous and coherent electroluminescence of one-mode InGaAsP/InP, InGaAsP/GaAs, and AlGaAs/GaAs heterolasers with a double heterostructure and a separation boundary with thin active regions (200-300 Angstroms) at a generation level of up to 60 kA/cm^2 . There is an inhomogeneous broadening of the radiation spectrum when four-component solid InGaAsP solutions are used. There is a correlation between the inhomogeneous broadening of the radiation spectrum and an anomalously wide generation spectrum (20-25 meV) when the Fermi quasilevel is not fully stabilized. The inhomogeneous broadening of the radiation spectrum for four-component solid InGaAsP solutions is attributed to spinodal decay. There are quasiperiodic inhomogeneities in the composition of solid InGaAsP solutions in the active region. Even at low generation levels the Fermi quasilevel is in the conductivity zone in some regions. The active region has a concentration of uncontrolled donors which becomes locally degenerated even at low generation levels. Figures 5; references 27: 8 Russian, 19 Western.

Photoluminescence of $(\text{SiC})_{1-x}(\text{AlN})_x\text{-SiC}$ Heteroboundaries

957A0289E St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 28 Nov 94 (manuscript received 22 Apr 94; signed to press 10 May 94) pp 1991-1994

[Article by Yu.N. Emirov, G.K. Safaraliyev, S.A. Ashurbekov, M.K. Kurbanov, Kh. I. Amirkhanov, Institute of Physics, Russian Academy of Sciences, Makhachkala]

[FBIS Abstract] The effect of laser annealing on the photoluminescence of $(\text{SiC})_{1-x}(\text{AlN})_x\text{-SiC}$ heteroboundaries is studied. During annealing, diffusion of Al atoms from the $(\text{SiC})_{1-x}(\text{AlN})_x$ film into the SiC substrate is observed with formation of replacement acceptors Al_{Si} , causing photoluminescence ($\lambda_{\text{max}} = 470 \text{ nm}$) in the SiC boundary region. Typical photoluminescence spectra before and after annealing are presented. After laser annealing the intensity of a high energy band with $\lambda_{\text{max}} = 470 \text{ nm}$ generated by the film increases by a factor of 8-12 compared with a band at $\lambda_{\text{max}} = 570 \text{ nm}$. The sole source of radiation is the SiC substrate. The epitaxial film makes no contribution to the photoluminescence spectrum. The band at 470 nm is associated with single Al_{Si} atoms. Figure 1; references 6 (Russian).

Electric Properties of Solid GaAlSb and GaAlSbAs Solutions

957A0289F St. Petersburg FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian No 28 Nov 94 (manuscript received 29 Apr 94; signed to press 10 May 94) pp 2001-2006

[Article by T.I. Voronina, B.Ye. Dzhurtanov, T.S. Lagunova, Yu.P. Yakovlev, Ioffe Physicotechnical Institute, Russian Academy of Sciences, St. Petersburg]

[FBIS Abstract] This paper examines the electric properties of epitaxial films of solid solutions of $\text{Ga}_{0.9}\text{Al}_{0.1}\text{Sb}$ and $\text{Ga}_{0.66}\text{Al}_{0.34}\text{SbAs}$ grown on n-GaSb substrates. The Hall coefficient, electric conductivity, and mobility are measured at 77-300 K in undoped samples and germanium-doped samples. Dependence on temperature is determined. The electric properties are the same for three- and four-component solid solutions close in composition to GaSb. Both three- and four-component solid solutions have p-type conductivity ($p \approx 10^{16} \text{ cm}^{-3}$ at $T = 77 \text{ K}$). When doped with solid germanium solutions, one can obtain materials with concentrations $p \approx 10^{19} \text{ cm}^{-3}$ despite the amorphous properties of the germanium. The segregation coefficient of germanium is determined, 0.15-0.2. Germanium dissolves well in solid solutions and yields materials with a high hole concentration. It is found that hole concentration decreases when Al or In is included. All solutions retain the structural defect $[\text{V}_{\text{Ga}}\text{Ga}_{\text{Sb}}]$. Figures 3; table 1; references 9: 8 Russian, 1 Western.

Rapid Thermal Diffusion of Zinc in a GaAs/Al_xGa_{1-x}As/GaAs Heterostructure

957A0289G St. Petersburg FIZIKA I TEKHNIKA
POLUPROVODNIKOV in Russian No 28 Nov 94
(manuscript received 24 Feb 94; signed to press
23 May 94) pp 2030-2035

[Article by V.N. Abrosimova, L.F. Avetisyan, A.F. Vyatkin, Yu.V. Dubrovskiy, A. N. Pustovit, Institute of Problems in Microelectric Technology and Especially Pure Materials, Russian Academy of Sciences, Chernogolovka]

[FBIS Abstract] This paper examines rapid thermal diffusion of zinc into GaAs-based structures with a heterobarrier to determine whether it is possible to use this process to manufacture electronic device structures. The process of rapid thermal diffusion of zinc is studied in n- and p-type GaAs and in a GaAs/Al_xGa_{1-x}As/GaAs heterostructure. The zinc diffuses from thin-film oxide sources (ZnO)_x(SiO₂)_{1-x} (x = 0.3) formed by centrifuging from film-forming solutions. Diffusion occurs in a N₂ atmosphere at 700-800°C in 6-12 seconds. The depth of penetration of Zn into the heterostructure is about 500 nm. The mechanism of Zn diffusion into a structure with a heterobarrier is analogous to the mechanism of Zn diffusion into GaAs. The mutual diffusion of Al and Ga at the heterobarrier in this temperature range is enhanced by Zn diffusion in a rapid thermal diffusion mode. Models are proposed to explain diffusion of Zn into GaAs and the associated phenomenon of superlattice disordering. The distribution of Al determines the shape and properties of quantum wells in structures with heterobarriers. The effect of rapid thermal annealing and rapid thermal diffusion of zinc on Al distribution in heterostructures is studied. Figures 4; references 18: 1 Russian, 17 Western.

Rapid Thermal Annealing of Semi-Insulating GaAs Irradiated With Reactor Neutrons

957A0289H St. Petersburg FIZIKA I TEKHNIKA
POLUPROVODNIKOV in Russian No 28 Nov 94
(manuscript received 9 Feb 94; signed to press
25 May 94) pp 2041-2044

[Article by T.N. Zaytseva, N.G. Kolin, O.L. Khukhto, K.N. Norochniy, A.I. Noyfekh, L.Ya. Karpov Scientific Research Physicochemical Institute, Obninsk]

[FBIS Abstract] Rapid thermal annealing is used to anneal radiation defects in samples of bulk semi-insulating GaAs irradiated with a full spectrum of reactor neutrons. The dependence of the Hall mobility of electrons μ on annealing temperature and time is studied. Rapid thermal annealing is more effective than prolonged annealing. It is found that at annealing temperatures below 850°C radiation defects are annealed and donors (Ge and Se) are electrically activated. There is also an increase in the concentration and mobility of electrons (electron mobility is increased by a factor of 1.3-1.5). Above 850°C the movement of Ge into the As sublattice predominates, which increases the degree of compensation and decreases the mobility of electrons. Acceptable deviations in the optimal annealing temperature and time are relatively small ($\Delta T_a = \pm 10^\circ\text{C}$, $\Delta t = \pm 5$ s) indicating that optimal rapid thermal annealing modes in GaAs are more sensitive to initial material and irradiation parameters than is the case for long thermal annealing. However, at low nuclear doping levels in GaAs rapid thermal annealing can improve electrophysical parameters. Figures 2; references 10: 2 Russian, 8 Western.

Development of Moscow Cellular Phone System Described

957A0071A Moscow RADIO in Russian No 11,
Nov 94 pp 2-3, 28

[Article by A. Grif under the rubric "Equipment of Our Times": "The Moscow Cellular Network: Cellular Telephone in the Office, the Car, and the Briefcase"—first paragraph is RADIO introduction]

[FBIS Translated Text] In our times cellular telecommunications systems are becoming the most promising type of mobile radio communication. They have begun to be introduced in various regions of the country. So that these systems would be compatible with each other, the Russian Federation Ministry of Communications has introduced state standards for cellular analog and digital communications systems. The analog network in Russia, and first of all in Moscow, is being developed on the basis of the NMT [Nordic Mobile Telephone]-450 standard. This is also told about in the published article. In the future the editorial board will acquaint readers with digital systems of cellular communications.

The abbreviation MCN—Moscow Cellular Network—is becoming more and more well known in the capital, the suburbs of Moscow, and Tver. A mobile cellular radio communications network, which has already won the majority of developed countries on all continents, is now being developed in precisely these regions. Unfortunately, in this advanced and very promising field of telecommunications Russia has fallen substantially behind. Especially as the service of Moscow communications workers that they were the first to proceed from the holding of competitions and debates and words to specific deeds is commendable.

Now from practically any point in Moscow and a number of rayons of the capital's oblast via a radio telephone, which has been installed in the office or car or is carried in a briefcase or in a jacket pocket, it is possible to talk not only with subscribers of the cellular network, but also to call any city, long-distance, as well as international telephone number.

For the present the MCN cannot boast of a large number of subscribers. Today there are about 7,000 of them. But this is an operating and developing network that is being expanded in Russia on the basis of an analog system of the standard NMT-450 (Nordic Mobile Telephone), which has been introduced in 14 European countries.

"The choice fell to NMT-450 not by chance," relates Vyacheslav Fedorovich Gurkin, general director of the MCN Limited Liability Company. "This system is enabling us not only to solve our own problems, but also to integrate rapidly in the information space of our immediate neighbors—Finland, Norway, Sweden, Poland, Bulgaria, and Romania. It has been adopted in Ukraine, Belarus, as well as in the Baltic states—Latvia, Lithuania, and Estonia."

"For Moscow the NMT-450 system was selected on a competitive basis from 20 submitted designs. Now this standard has been approved by the Russian Federation Ministry of Communications as a federal standard for the 450 megahertz band."

"The winners of the competition, the American companies U.S. West International and Milicom International Cekkuar S.A., as well as the Moscow communications organizations Mezhdugorodnyy i mezhdunarodnyy telefon GP, the Moskovskaya gorodskaya telefonnaya set Production Association, the State Patent Information System and the Intersectorial Scientific-Technical Complex of Microsurgery of the Eye became the founders of our joint Russian-American enterprise, which was registered at that time as the Moskovskaya sotovaya set Limited Liability Company."

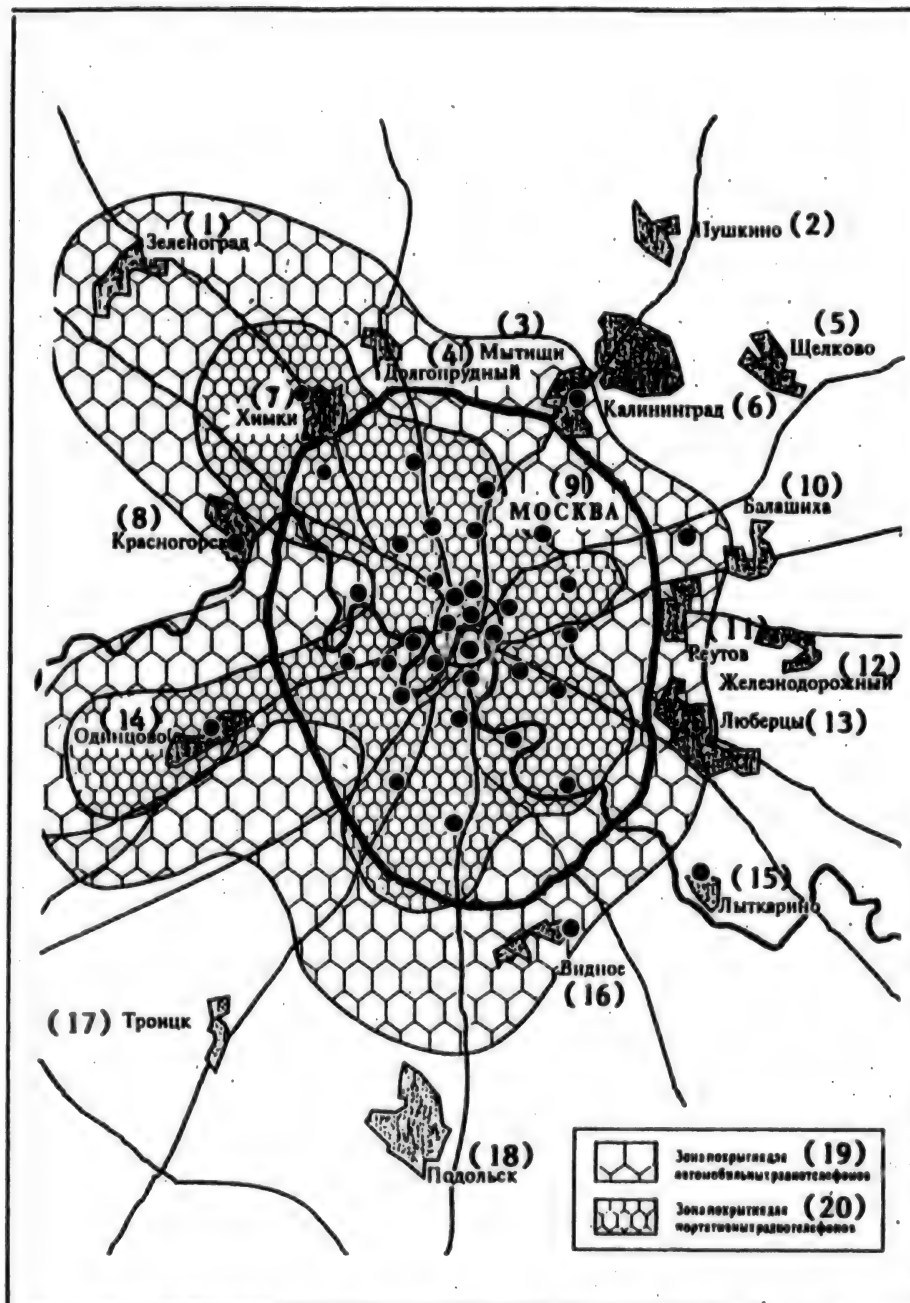
"We obtained our official legal status in early 1992, while today 90 percent of the territory of the capital and several adjacent rayons of the oblast have been included in the cellular communications service zone. Tver with the population centers closest to it have been included here."

What is the configuration of the cellular communications system of the capital? What are its hardware components and their capabilities? I succeeded in getting answers to these questions, having equipped myself with car and portable radio telephones and having traveled with MCN specialists over the radial and ring main roads, and having visited two base stations and the Moscow Mobile Service Switching Center (MTX) in the region of Ulitsa Butlerova.

The map published here gives an idea of the scale and structure of the cellular communications system. At its center (not geographic, but structural) is the MTX network switching center. Some people in the MCN call it the "heart," and others call it the "brain" of the network. But, judging from the most important and numerous functions which it performs, it is both.

The Moscow Mobile Communications Switching Center manages 28 base stations (on the map they are designated by black circles). It occupies a small area of one of the operating rooms, being next to the equipment of the international communications complex which was built in its day for the Moscow Olympics. The most complex electronic switchboard blocks of the Swedish firm Ericsson are concentrated here in a few small blue and white cabinets. A central processor unit, which carries out the overall control of the cellular communications network of the capital on the basis of central software, is its basis. The main and auxiliary switchboard subsystems—the main lines of group switching, telephone communications with mobile objects and others—are located in these cabinets in the form of quite miniature modular blocks. They operate on the basis of their own processors and programs.

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Key: 1. Zelengrad; 2. Puskino; 3. Mytishchi; 4. Dolgoprodnyy; 5. Shchelkovo; 6. Kaliningrad; 7. Khimki; 8. Krasnoorsk; 9. Moscow; 10. Balashikha; 11. Reutov; 12. Zheleznodorozhnyy; 13. Lyubertsy; 14. Odintsovo; 15. Lytkarino; 16. Vidnoye; 17. Troitsk; 18. Podolsk; 19. Coverage zone for car radio telephone; 20. Coverage zone for portable radio telephones

The switchboard is connected via digital radio relay links with all the base stations, conducts radio traffic with them, stores in its memory data of all the subscribers of the MCN, processes information about their work and inquiries, carries out switching, and switches calls in the

process of a conversation. Precisely through the switchboard the subscriber can conduct international communication with any point of the planet (the MTX has three outlets to international lines), as well as through long-distance channels with any city of Russia and the countries

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of the CIS, can enter the city telephone network or have a conversation, bypassing citywide automatic telephone stations, with one of the correspondents of the cellular network. Precisely the systems that are a part of the MTX will afford subscribers the opportunity to organize conference communications, facsimile exchange and data transmission.

However important the role of the switchboard of the MTX is in the Moscow Cellular Network, only owing to the base stations, which have been located in different rayons of the capital and the Moscow suburbs, is it acquiring the features of precisely cellular mobile radio communications.

The base stations are low-power transceivers, each of which serves the subscribers of its cell. They operate in the range of 420...490 Mhz. The standard frequencies for transmission channels usually encompass 453...457.5 Mhz, for reception channels 463...467.5 Mhz. The NMT-450 system is designed for 180 radio channels. However, the MCN thus far has received only 121 channels, which is complicating substantially frequency planning in Moscow. Nevertheless the cellular network is making it possible to use the frequency spectrum very economically. The point is that whereas neighboring base stations use different frequencies, ones distant from each other are operating on the same frequencies.

"Our subscribers," says Vyacheslav Fedorovich, "can simultaneously conduct without interference on one channel conversations from Sviblov, from Odintsov, from the region of the Belarus Railroad Station..."

We visited one such base station near the Belarus Railroad Station. Its transmitting and receiving antennas (their photographs were published on the front cover of last issue of the journal RADIO) are installed on the roof of a 15-story building, while the unattended equipment—two miniature bays of the Finnish firm NOKIA—operates under lock and key in a room with an area of 12-15 square meters. The control of the station is remote, from the switchboard of the MTX, with which it is linked by a digital radio relay link. The boundaries of the Belarus Cell extend approximately from the Aeroport Metro station in the north to Zamoskvorechye in the south. Serebryanyy bor and the regions of the Savelevskiy and Riga railroad stations belong to it.

The subscribers of the MCN, as a rule, use Benefon max, Nokia-620, Nokia-150, Motorola and other car or portable radio telephones. For example, the Benefon max is a portable radio telephone. Fastened to your belt or in a pocket or briefcase, it is always ready for operation. A radio telephone, which has been installed in a motor vehicle with a speaker system, increases driving safety, since during conversations it is not necessary to hold the telephone in one's hands. The weight of the model is 500 grams, the talking time without charging is 1.5 hours, while in wait mode it can be turned on for up to 15 hours. The radio telephone is furnished with an LCD and has a 99

number memory and an answering machine in the form of a digital device for 120 messages. By means of a line converter it is possible to attach a computer to it and to send or receive facsimile information.

The Nokia-620 portable radio telephone has approximately the same parameters and functional capabilities. For transmission it operates subject to the distance from the base station in two modes, emitting 7 watts for 35 minutes or 1.5 watts for up to 70 minutes. Indications of the field voltage and battery charge and the time of conversations are constantly lit up on its alphanumeric display.

However, no matter what model the subscriber of the NMT-450 network uses, in addition to a transceiver with an electronic frequency synthesizer, a microprocessor-based logic and control block is included without fail in the design of the radio telephone. It also supports the entire communication process in automatic mode and processes signals from the keypad when placing a call and from the air in case of an incoming call and reads out information to the display.

Practically immediately after dialing the number the radio telephone begins the automatic search for a free transmission channel. As soon as it is detected, the station establishes contact and the dialed number is transmitted through the base station to the switchboard. Depending on the code (international, long-distance and local service) the switchboard makes a connection by the appropriate communications services.

In case of a call to a subscriber of the cellular network (regardless of where the call has come from—from abroad, another city, the Moscow telephone network or another subscriber of the MCN) the switchboard of the MTX checks in its memory whether there is such a number in its zone and the category of the subscriber, after which it begins the search for him in one of the cells, that is, it gives through all the base stations a selective call. The radio telephone of the subscriber, having picked up its number, automatically transmits confirmation on a free duplex channel and thereby specifies its location. The MTX finds a free voice channel in this cell and uses it for carrying out communication.

The role of the switchboard complex does not end with this. Through the base stations it monitors the progress of communication as the vehicle of the subscriber moves. If the signal-to-noise ratio in the channel, which the subscriber is using, reaches a critical level, a lower base station is sought and in the process of conversing switching takes place. Here not only is communication not interrupted, but the subscriber will not even be aware that he has switched from one frequency channel to another.

For nearly two years hardware and software, which were delivered by the Ericsson firm, have performed all these and many other functions in the Moscow Cellular Network.

In the article the hardware of other foreign suppliers and ...not one Russian enterprise was mentioned. Unfortunately, this is not an accident.

"Yes, our radio industry," laments the general director of the MCN, "thus far is not producing such advanced communications equipment. But to wait until this happens means to continue lagging behind the leading countries. That is also why the decision on the development of a regional network on the basis of foreign hardware was made."

In our conversation another question remained uncovered: The extensive introduction of an analog, not digital, system is causing some specialists apprehension—did the Moscow communications workers choose the correct strategic direction? For the digital standard GSM (which has also been included in the Federal Standard), which is expanded as global service mobile, applies to second-general systems, and precisely they have a future. The use of GSM is not only the possibility of talking by radio telephone from any point of earth, but also data transmission, facsimile exchange, and a number of other services, and, what is important, a less busy and, therefore, more promising range.

"It is difficult not to agree with the conclusions about the merits of digital technology," Vyacheslav Fedorovich agrees. "First of all, It makes it possible to use frequencies more efficiently. However, radio communications cannot be an independent system, but should be combined with the existing infrastructure of communications and be a natural addition to the long-distance and local network. In Russia, as is known, many analog networks are operating. While the NMT-450 standard, although having been put into effect in Northern Europe

back in 1981, thus far has completed justified itself, since it has been adapted well precisely to analog networks."

NMT-450 is particularly suited to Russian conditions. One-fourth as many base stations as compared with other systems are required for the development of a network. And this, after all, is an important economic factor, when it is necessary to serve large, but not densely populated spaces. Another by no means unimportant advantage of the system is the possibility of the rapid setting up of a network.

Such networks are already operating in St. Petersburg and Tver. Next to come are Voronezh, Vladimir, Smolensk and other nearby and distant regions, where the NMT-450 system will find its place.

Great prospects are seen in the introduction of roaming—the granting to subscribers of the opportunity to use their phone numbers and radio telephones when going to "alien" cellular communications zones. Roaming services are being made available in St. Petersburg, Lithuania, Estonia, and Latvia. That is why we say that Nordic Mobile Telephone is in earnest and for a long time.

We should merely add to this opinion of the general director of the MCN that the concept of the development of cellular mobile communications systems in Russia, which has been adopted by the Russian Federation Ministry of Communications, not only does not preclude, but permits the coexistence in the same region of networks with different standards, and, consequently, it is advisable to use the Federal Standard GSM.

The Mobilnyye telesistemy Joint-Stock Company, which is developing a digital cellular network of the GSM standard, has begun to operate in Moscow. This is one of the examples of the elimination of the monopoly in electrical communications of Russia.

Shock-Wave Compression of Aluminum Under 1.7 TPa Pressure

957A0124A Moscow *TEPLOFIZIKA VYSOKIKH TEMPERATUR* in Russian Vol 32, No 6, Nov-Dec 94 (manuscript received 29 Apr 94) pp 952-955

[Article by M.A. Podurets, V.M. Ktitorov, R.F. Trunin, L.V. Popov, A.Ya. Matveyev, B.V. Pechenkin, and A.G. Sevastyanov, All-Russian Scientific Research Institute of Experimental Physics, Arzamas; UDC 532.593]

[FBIS Translated Text] Determining the compressibility under high pressures by absolute methods is of special importance, because the relative compressibility of various light substances (quartz, water, porous material) is being measured with an aluminum shield as the reference standard. Absolute measurements of its compressibility, by the reflection method, will then facilitate conversion of the relative compressibility of light substances into their absolute one.

Because the upper pressure limit for compressibility measurements in a laboratory is now 5 Mbar or lower [1], the only way to record higher compressibility is to have a shock wave generated by nuclear explosion strike a specimen of the tested material. The γ -tracer method has been proposed for determining the absolute compressibility of substances and measurements by this method successfully performed [2]. The method involves measuring both the wave velocity D and the mass velocity U in a substance by tracking the motion of γ -radioactive tracer layers installed in a specimen of that substance. Such layers, thin pellets of a γ -radioactive substance, are moved by a shock wave past collimating slits so that the γ -radiation pulses emitted by these tracers imprint time markers on an array of sensors. The wave velocity is determined from the passage of two γ -radioactive layers "through" two collimating slits. The mass velocity is determined from the time taken by one such pellet to pass through by collimators.

Processes taking place in specifically designed γ -tracer tests have already been thoroughly analyzed and appropriate recommendations been made regarding the use of this method [3]. Here we will examine closely the main ones. First of all, the γ -radiation source must be made of a substance whose nuclei have a cross section for radiative capture at least thousand times larger than that of nuclei of the tested substance. Such a large difference makes it possible to extract the useful γ -tracer signal from the total ambient γ -radiation.

Because fast neutrons with an $E_n \geq 1$ MeV energy predominate in the nuclear explosion spectrum while they can be captured when their energy is lower than that, it is necessary to ensure test conditions where incidence of the neutron pulse precedes the gasdynamic stage of motion by a time as long as needed for the neutrons to slow down in the target substance to the optimum for their capture energy.

A good γ -tracer for aluminum is europium (in the tests was actually used its Eu_2O_3 oxide). For the Al-Eu pair and an about 0.5 cm thick tracer layer, maximum intensity of a γ -radiation source is obtained with 10-100 eV neutrons (about 200 b cross section for n, γ -reactions) and the time for fast neutrons to slow down to an energy within this range is then 10-50 μs .

The second problem is with heating of the substance during slowdown of neutrons in aluminum and intense activity of the γ -tracers. In view of this, our experiment was designed to maximally minimize nuclear heating. Calculations made in great detail by the Monte Carlo method indicate that heating of the aluminum specimens nowhere exceed 20-40 J/g and, therefore, was in this case quite insignificant.

The third problem are ambient effects produced in the test apparatus and in the environment by the primary neutron stream and by γ -quanta emitted during n, γ -reactions. Protection of photodetectors against ambient γ -radiation requires special shielding with lead sheaths on both sides, where they face the tracers and where they are exposed to the stream of neutrons stream emanating from the charge.

In our experimental setup these effects (and also several other ones) were maximally minimized. This was found to be made possible by use of an energy source more powerful than the one used before [3], so that the specimens could be placed farther away from it.

Setup for Measurements. The setup for measurements is shown schematically in Figure 1. Its general features duplicate those of the earlier setups [2,3]. Most readily realizable is a simple scheme with a planar configuration. Accordingly, an interlayer of a light substance was placed with one of its plane surfaces close to the charge (source of energy and powerful n, γ emissions) so that the shock wave would pass through it before reaching the aluminum slug. Both surfaces of this interlayer had been formed to be perpendicular to the common axis through their centers and the center of the charge. Deviations from perpendicularity did not exceed 1° . Thus was ensured planarity of the shock wave. The mount for a slug of grade A-1 aluminum was placed on the inside surface of the interlayer at a certain distance from the charge. It consisted of three plates: a 30-mm thick shield on top, a 100-mm thick base plate underneath, and a 100-mm thick substrate plate. In both plates had been cut 5-mm deep slots 100 mm wide and 100 mm long, into which were then pressed 2.5 mm thick pellets of Eu_2O_3 whose initial density was $\rho_{00} \approx 2.7 \text{ g/cm}^3$ and thus equal to that of aluminum. On their open side they were all covered with an aluminum plate of the same thickness. Parallel to the tracer pellets was placed a collimator set consisting of three lead disks with slits, carrying scintillators and detectors of the FEK type. Signals from the detector array were transmitted over radio-frequency cables to the measuring complex and there recorded on high-speed oscillographs with a (+/-)5

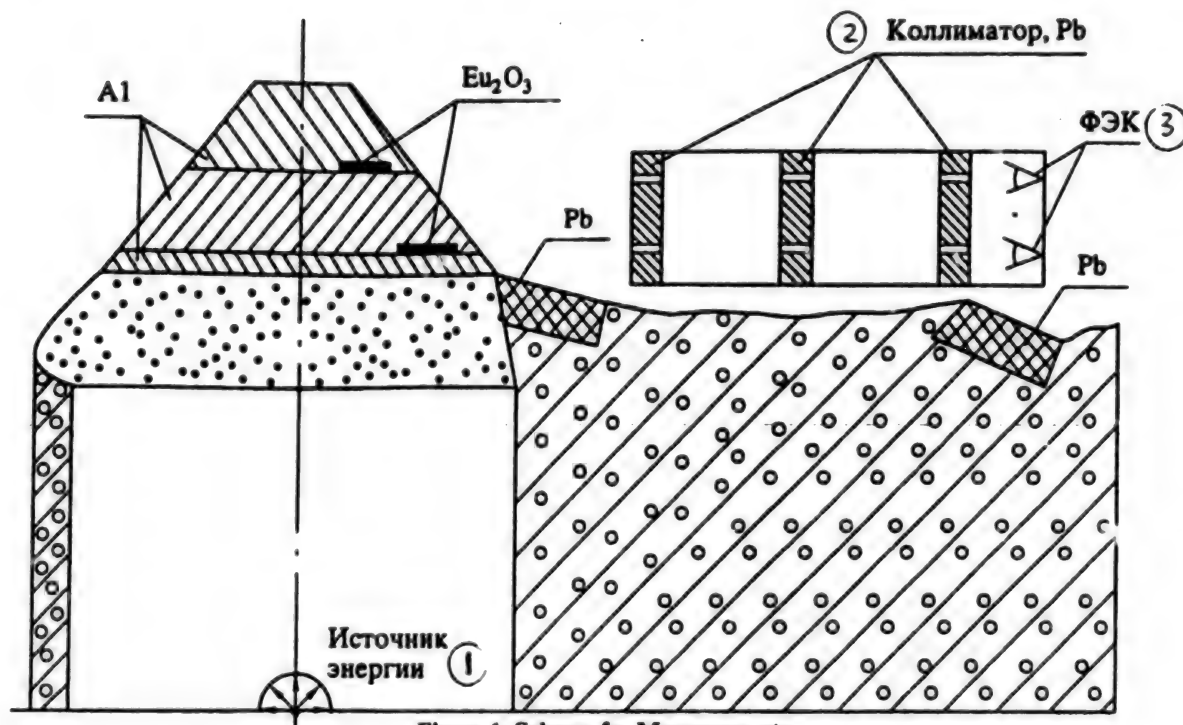


Figure 1. Scheme for Measurements.

Key: 1. energy source; 2. collimator; 3. photoelectric converter

ns time resolution. The distance from the scintillator array to the tracer pellets was 250 cm. Pieces of lead between the test specimen and the scintillators shielded the latter from ambient radiation on this side, the lead shield of a 90-mm overall thickness covering the entire area occupied by the scintillators and the detectors except for the 1.9-mm wide slits. The slits had been carefully positioned relative to one another as well as relative to the surfaces of the Eu_2O_3 pellets. This arrangement ensured a principal configuration where each tracer pellet was facing the corresponding to it collimator slit and so radiation emanating from it did not reach the corresponding detector until a shock wave moved the tracers into the field of vision of the collimating slits and the detectors.

Shielding from radiation on the charge side was provided by a combination of an overall $\Delta \approx 50$ cm thick polyethylene wall with $\text{B}_4\text{C}_3 + \text{Pb}$ filler powder and a large slab of concrete.

Estimates based on theoretical calculations and validated by the experiment indicate that this shielding ensured normal operation of the detector set. It is also to be noted that the free surface marked by an arrow in Figure 1 had been covered with a 50-mm thick layer of lead shot so as to slow down scattering of this surface and correspondingly prevent eclipsing of the "light" beam by a tracer pellet.

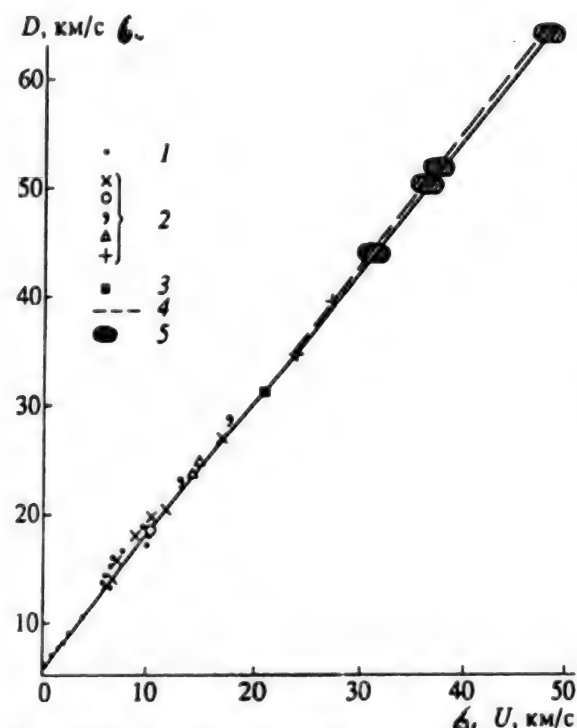
Experimental results. As has already been said, for determining the wave velocity it is necessary that the shock wave move both tracer pellets, i.e., travel the base length in aluminum till radiation emitted by them can reach the FEU (photomultiplier) detectors through the slits. The base length for measurement is the distance between two collimating slits, identically equal to the distance between the tracer pellets. For recording the mass velocity it is necessary that the first tracer in the path of the shock wave move to the second slit, where the third γ -radiation pulse would be recorded (assuming that the velocity of tracer motion is equal to the mass velocity in the substance under investigation).

The following lengths of time were recorded in the experiment: $t_{1-2} = 0.328 \mu\text{s}$ and $t_{1-3} = 0.504 \mu\text{s}$. The average shock wave velocity and mass velocity (on a $\Delta x = 99.45$ mm long base) were: $D_{av} = 30.3$ km/s and $U_{av} = 19.7$ km/sb respectively. These are preliminary results. They must be corrected to account for a slight unsteadiness of a shock wave during its passage through the aluminum slug.

As was mentioned earlier, the actual position of the aluminum slug relative to the energy source had reduced this correction to a minimum. That unsteadiness must nevertheless be accounted for. Both velocities have been corrected on the basis of calculations yielding finally: $D = 30.50 (+/-)0.7$ km/s,

$U = 21.00 (+/-)0.6$ km/s under a pressure, $P = 1.73$ TPa in aluminum with a density,

$\rho = 8.69 \text{ g/cm}^3$,
($\rho/\rho_0 = 3.21$).



Key: Figure 2. Hugoniot curves of aluminum: 1. laboratory data; 2. measurements made during underground explosions; 3. point obtained in this study; 4. disposition of the Hugoniot curve according to data in reference [6]; 5. ellipse of possible experimental D-U points in reference [4]; 6. km/s

The measurement error is an estimable quantity, its magnitude being determined by imprecision of oscillograph readout, by the width of pulse time spread due to finite width of the collimating slits and presence of scattered γ -quanta, by the mass velocity in a substance not necessarily being identical to the velocity of tracer inserts as has been assumed, and by other factors.

Our experimentally established velocity point in the D-U plane is on the diagram in Figure 2 compared with results of numerous other laboratory determinations,

also with results of absolute measurements [2,3] and relative measurements [4,5,6]. Within their range there is evidently an entirely satisfactory agreement between all the results.

The results of all these high-pressure experiments reveal, moreover, a linear (or almost linear) D-U relation with a slope $dD/dU = 1.2$ which also characterizes the calculated relation in the ultrahigh pressure range [7].

New measurements are being made to supplement the already available data and to more definitively determine the disposition of the Hugoniot curve in the given pressure range. Within the $11 \text{ km/s} < D < 70 \text{ km/s}$ range of wave velocity its relation to the mass velocity can now be described by the linear relation $D_{Al} = 5.90 + 1.19U$ ($\rho_{Al,0} = 2.71 \text{ g/cm}^3$).

The authors thank A.K. Zhitnik and Ye.S. Makarova for calculating the propagation characteristics of neutrons and γ -rays by the Monte Carlo method.

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Determination of Chloride Ions by Ion Chromatography in the Coolant of the Primary Circuit of a Nuclear Power Station

957A0312A Moscow ZAVODSKAYA LABORATORIYA
in Russian No 12 Dec 94 pp 8-9

[Article by A. D. Karpyuk, M. V. Vakhrusheva and N. K. Sazhina, All-Russian Scientific Research Institute of Inorganic Materials imeni A. A. Bochvar, Moscow; UDC 543.422]

[FBIS Translated Text] A procedure is developed for determining microquantities of chloride ions in the presence of boric acid by two-column ion chromatography. The values of the standard deviation over the entire range of determined concentrations are 0.05-0.04. The procedure was used to determine Cl^- ions in the coolant of the primary circuit of the Kola AES.

Dependable control of the concentration of chloride ions in the coolant of power production facilities with the purpose of optimizing the chemical conditions of the aqueous agent and lengthening the life of equipment is an urgent task owing to the high corrosiveness of Cl^- in relation to metals [1]. Boric acid containing chloride ions as an impurity is introduced into the aqueous coolant of the primary circuit of a nuclear power station operating with VVER reactors [water-cooled, water-moderated power reactors] in order to maintain reactivity. Accelerated corrosion of equipment in the presence of Cl^- may cause leaking from the circuit, and as a consequence, a serious ecological accident. All of this predetermines the economic and social importance of this work.

Determination of inorganic anions in the coolant of the second loop of a nuclear power station by two-column ion chromatography was communicated earlier [2,3]. The same approach is used in this study to determine Cl^- in the coolant of the primary circuit. At the same time determination of Cl^- by two-column ion chromatography is complicated by the matrix effect of H_3BO_3 [4]. Thus, it is shown in [4] that when resins prepared from styrene divinyl benzene are used as the anion exchanger, the magnitude of the analytical signal depends complexly on the boric acid concentration. The magnitude of the matrix effect may be determined by the nature of the sorbent, which is why the influence of boric acid upon determination of Cl^- when a sorbent based on oxymethylmethacrylate-ethylenedimethacrylate (KhIKS-1) is used was studied in the first phase.

The work was done with a Tsvet-3006 ion chromatograph. Determination of Cl^- at a level ≥ 1 mg/liter in the presence of H_3BO_3 showed that Cl^- is detected well in the presence of macroconcentrations of boric acid, and a fifteenfold excess of H_3BO_3 in relation to Cl^- does not hinder its determination (see table). The chromatography conditions are as follows: 4x100 mm separating column filled with KhIKS-1, 6x200 mm suppressing column filled with KRS-8P-740; eluent— $2.4 \times 10^{-3} \text{M}$ Na_2CO_3 - $3 \times 10^{-3} \text{M}$ NaHCO_3 .

Determination of Chloride Ions in the Presence of Boric Acid

Cl ⁻ Introduced, μg/liter	Height of Cl ⁻ Peaks, mm, at an H ₃ BO ₃ Concentration of, gm/liter			
	2	10	30	40
0	4	4	4	4
10	25	24	24	23
20	34	37	38	38
40	68	66	66	65
80	130	134	132	130

The results of the influence of H_3BO_3 on determination of Cl^- ions are presented below:

Cl ⁻ , mg/liter	H ₃ BO ₃ , gm/liter	A, mm	t, min
10	-	158 2	24
10	0.15	158 2	24
10	0.39	167 2	25
10	1.0	191 2	26
10	4.2	191 2	26
10	15.0	192 2	27

A further increase in the concentration of H_3BO_3 leads to a slight overstatement of the results of determining Cl^- . Another picture is observed upon transition to determination of chloride ions after preliminary concentration of the sample. In this case even in the presence of boric acid at 2 gm/liter, when a standard eluent is used not only is there no correlation between the value of the analytical signal h and the Cl^- concentration, but also the times of retention of Cl^- increase dramatically in successive analyses. All of this is evidence that use of a carbonate eluent to determine Cl^- in the presence of boric acid by two-column ion chromatography does not permit dependable determination of Cl^- at ion concentrations greater than 1 μg/liter. We established that replacement of the eluting CO_3^{2-} ion by $\text{B}_4\text{O}_7^{2-}$ eliminates the problems indicated above, but the Cl^- retention time is long—40 minutes. Therefore in order to reduce the influence of boric acid on determination of chloride ions and increase the speed of analysis, "generating" the eluting ion directly in boric acid solution used as the eluent was proposed. For this, 6 ml of a 1 N solution of NaOH were added to 1 liter of 2 percent H_3BO_3 solution. It should be noted that in this case it is rather difficult to uniquely determine the eluting ion; we are more likely dealing with an equilibrium in which OH^- ions and the anions of boric, tri- and hexaboric acids participate. Clarification of the nature of the eluting ion was not within the objective of this investigation, the goal of which was to solve the practical problem of determining Cl^- in the presence of H_3BO_3 . The effectiveness of the proposed element was studied in an analysis

of samples containing, 10, 20, 40 and 80 $\mu\text{g/liter Cl}^-$ in the presence of macroconcentrations of H_3BO_3 (see table).

It is evident from the data in the table that throughout the entire range of determined concentrations of Cl^- , change in boric acid concentration has practically no effect on the values of the analytical signal for Cl^- . In this case satisfactory linearity is achieved in the calibration graph plotted with different concentrations of H_3BO_3 (> 0.97). The obtained data show that under the selected conditions, two-column ion chromatography may be used for quantitative determination of Cl^- in the aqueous heat-transfer agent of the first loop of a nuclear power station. The values of the standard deviation throughout

the entire range of determined concentrations are 0.05-0.04. The procedure was used to determine Cl^- ions in the coolant of the primary circuit of the Kolskaya AES.

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Competitive Metallic Unit for Scrubbing Exhaust Gases of Gasoline Internal Combustion Automobile Engine

957A0189A Kiev EKOTEKHNOLOGII I
RESURSOSBEREZHENIYE in Russian No 2,
Mar-Apr 94 (manuscript received 10 Dec 93) pp 20-23

[Article by B.I. Musiyenko, V.D. Parkhomenko, B.V. Farmakovskiy, and A.P. Khinskiy, UkrPK-TIpromtekhkompleks, Kiev; UDC 621.434.068]

[FBIS Abstract] At the present time, ceramic and metallic honeycomb units are used as exhaust gas neutralizers in motor vehicles. Metal units have several important advantages over their ceramic counterparts; for example, their walls are only one-third as thick as those of ceramic units, metal matrices have an open cross section of 90 percent (versus 75 percent in the case of ceramic units), their superior heat conduction enables them to heat to their operating temperature within the first 80 seconds after a cold start, and they withstand mechanical loads and vibrations better than ceramic units. One way of reducing the cost of metal units is to improve the process used to apply the secondary carrier of $\gamma\text{-Al}_2\text{O}_3$ catalyst onto the unit. A plasma-torch spraying technique has been developed for applying the carrier that makes use of raw materials available in Ukraine. The new technique was used to make laboratory batches of the materials needed to produce and stabilize secondary carrier. In a single pass, a 0.03- to 0.04-mm-thick layer of cerium dioxide-stabilized secondary carrier was applied to the surface of a 0.04- to 0.05-mm-thick strip of heat-resistant steel foil. The coating's adhesion to the metal substrate is so good that the strip can be corrugated after it has already been coated. The metal catalytic unit coated by the new process are corrugated so as to have 50 lengthwise channels per square centimeter of their cross section. After having been profiled, the corrugated and plane strips are coated on both sides, rolled into rolls, and fastened by electrostatic percussive welding. The test metallic catalytic converter units conformed to full-scale units in all respects (channel geometry, thickness and characteristics of the secondary carrier, number of channels per square centimeter, etc.). The units' cross sections were reduced in proportion to the amount of exhaust gases passing through them and provided a space velocity of about 50,000/h. After heat treatment in air, the carrier's specific surface ranged from 60 to 70 m^2/g . Tests of the new metallic units under laboratory conditions and with real exhaust gases at an experimental plant with the power-generating set of a ZAZ-1102 Tavriya automobile and SAK-670 brake stand (produced in the former GDR) confirmed that they are fully competitive with existing catalytic converter units. In tests with air-fuel ratios $[\alpha]$ of 0.99 to 1.01, the new units actually proved superior to units manufactured by the conventional technology. Specifically, the new units neutralized CO and CH with an efficiency of 90-92 percent (the conventionally produced units neutralized only 75-84 percent of the CO

and 75-88 percent of the CH), and they neutralized 80-84 percent of exhaust NO_x (the conventional units neutralized 70-84 percent). In view of the aforesaid laboratory test results, a pilot industry plasma-torch spraying unit is being created to permit additional bench tests of the new process for producing secondary carriers. References 5: 2 Russian, 3 Western.

Ways of Improving the Efficiency of Processes of Thermal Neutralization of Organochlorine Toxic Wastes

957A0189B Kiev EKOTEKHNOLOGII I
RESURSOSBEREZHENIYE in Russian No 2,
Mar-Apr 94 (manuscript received 26 Nov 93) pp 31-36

[Article by I.N. Karp, V.Ya. Konyukh, V.V. Chetverikov, N.N. Grinchenko, and Ye.P. Martsevov, Gas Institute, Ukrainian Academy of Natural Sciences, Kiev; UDC 577.4:537.521.1:66.092.9]

[FBIS Abstract] The main method of neutralizing toxic organochlorine wastes is by incineration. In essence, incineration involves the following steps: 1) releasing the chlorine with complete (to CO_2) or incomplete (to CO) oxidation of the starting substance in a process of autothermal combustion or by supplying heat from without; 2) binding the chlorine into HCl; 3) neutralizing the HCl; and 4) extracting the chlorine-containing products from the off-gases. Chlorine inhibits the process of combustion of organochlorine materials by extending both the time and space required for the incineration process. In view of this fact, the first step in developing a specific process to neutralize organochlorine toxic wastes at specific sites is to determine whether the level of chlorine present in the waste is low enough to warrant a one-stage incineration process or whether a two-stage process involving incomplete oxidation of the waste (from carbon to CO) is required. Other process parameters that must be selected include the amount of time for which the gases are kept in the furnace, the minimum temperature in the furnace's working space, and the required surplus of oxidizing agent. Because of the problems that have been encountered with regard to meeting established toxic emission standards when universal rotary furnaces are used to incinerate organochlorine wastes, the use of small mobile incinerator units with replaceable modules for specified types of waste instead of stationary incinerator units has been increasing. Two strategies for refining the process of incinerating organochlorine materials that appear especially promising are raising the process temperature by using plasma heat sources and adding additional reagents to the combustion zone to promote more complete defixation of the chlorine and to prevent the formation of secondary toxic compounds. Replacing a portion of the air used in the combustion process with steam has proved to be effective in reducing the amount of nitrogen oxides in incineration products. The ratio of hydrogen to chlorine in the starting organochlorine wastes is a good criterion for selecting the composition

and quantity of additional reagents and temperatures used during the incineration process. For the sake of convenience, organochlorine toxic wastes can be divided into wastes with low ($C/H < 1$) and high ($C/H \geq 1$) levels of chlorine. Waste with low levels of chlorine (including chlorobenzene and DDT) does not require the use of additional hydrogen-containing reagents; rather, the main measure needed to suppress the chlorine's inhibiting effect on the combustion process required with low-chlorine waste is to raise the temperature locally in the area where the organochlorine material is mixed by bringing in additional energy. This can be accomplished by preheating all or part of the oxidizing agent. In the case of waste containing high levels of chlorine (such as tetrachlorobenzene and chloroform), the hydrogen contained in the waste materials themselves is inadequate to bind chlorine in HCl. When flame incineration is used, the shortage of hydrogen is generally compensated for by incomplete oxidation of some additional fuel, which in turn results in a lowering of the process temperature and the formation of secondary toxic compounds. In view of the fact that far fewer secondary toxic compounds are formed when steam is used instead of methane-air mixtures, steam conversion with plasma heating of the heat transfer agent may be competitive with flame methods throughout the entire range of incineration temperatures used. The effectiveness of the aforesaid measures demonstrates that organochlorine waste incineration processes do not necessarily have to be designed by purely statistical optimization methods; instead, individuals designing processes organochlorine waste incineration processes can be guided by the physicochemical processes of the starting waste, the characteristic features of its oxidation mechanism, and the effect that oxidizing agent composition has on the formation of secondary toxic compounds. Figures 4; references 9: 4 Russian, 5 Western.

Ecologically Pure Process of Recycling Diamond Tools

957A0189C Kiev EKOTEKHNOLGII I
RESURSOSBEREZHENIYE in Russian No 2,
Mar-Apr 94 (manuscript received 28 Dec 92) pp 37-42

[Article by V.P. Orel, B.F. Dmitruk, O.G. Zarubitskiy, and Kh.B. Kushkhov, General and Inorganic Chemistry Institute, Ukrainian Academy of Natural Sciences, Kiev; UDC 502.3:541.135.3+669.27+546.26-162]

[FBIS Abstract] An alternative ecologically pure method was developed for recovering materials such as commercial-grade diamonds, tungsten, cobalt, copper, and nickel from worn diamond tools. The method is based on oxidation of the main component of hard-alloy composites, i.e., tungsten carbide, in sodium hydroxide-based melts. The new recovery process includes electrochemical and hydrometallurgical processes that are distinguished by their high intensity, efficiency, and ecological purity. Preliminary thermal and x-ray phase analyses established that tungsten carbide is oxidized, albeit

slowly, by the oxygen in air at temperatures of 450-500°C, whereas synthetic diamonds remain stable at temperatures up to at least 550°C. Consequently the products of the oxidation of WO_3 and CO_2 react with molten NaOH to form sodium tungstate and carbonate, which are easily soluble in an alkaline melt. The products of oxidation of WC do not screen the reaction surface, and the reaction rate is limited by the supply of oxygen through the melt. An electrolyzer was designed for use in implementing the proposed recovery process. The following process parameters were determined to be optimum: primary charge of alkaline melt loaded into the electrolyzer, 80 kg; electrolyte temperature, 520-540°C; anode current density, 0.9-1.1 A/cm²; cathode current density, 0.4-0.5 A/cm²; and ratio of the melt mirror and cathode area, 2:3. The newly developed electrolyzer had a capacity of 1 kg hard-alloy matrix/h. In tests conducted under preproduction conditions at the Terek Diamond Tools Plant, the new recovery method was successfully used to extract commercial-grade diamonds and valuable nonferrous metals from worn diamond tools. All of the valuable elements contained in the slime resulting from anode treatment of worn diamond tools are in a state convenient for selective extraction in accordance with a simple process flow involving rinsing the slime in hot water with intensive agitation until the components of the alkaline melt (NaOH, Na_2WO_4 , and Na_2CO_3) pass into the solution. At the same time, the metallic phase, which consists of weakly meshed finely dispersed particles, is dispersed. The mixture of diamond and metal powder that remains after filtration and rinsing of the sediment is passed through a sieve and subjected to wet separation. The diamonds remaining in the sieve are rinsed a final time in a hydrochloric acid solution of hydrogen peroxide. The metal phase remaining after the diamonds have been removed is virtually free of tungsten and consists of copper and metals of the iron subgroup that have been visibly oxidized during the rinsing and drying process. The copper is extracted by reducing the mixture with hydrogen and then processing it with hydrochloric acid. The metals of the iron subgroup pass into the solution, and the pure copper residue is rinsed and dried in an inert atmosphere. Familiar hydrometallurgical methods are then used to extract the cobalt and nickel from the hydrochloric acid solution. The alkaline-tungstate solution remaining after the slime has been rinsed is virtually free of impurities and is a convenient starting material for producing pure tungstic acid and tungsten trioxide. Figures 3, tables 2; references 8: 6 Russian, 2 Western.

Monitoring Industrial Wastes—Important Factor in Resource Conservation

957A0189D Kiev EKOTEKHNOLGII I
RESURSOSBEREZHENIYE in Russian No 2,
Mar-Apr 94 (manuscript received 9 Jun 93) pp 51-54

[Article by O.I. Bent, Geoprognoz GGP, Kiev; UDC (502.76:622.7-17).004.18]

[FBIS Abstract] More than 1.5-1.6 billion metric tons of solid industrial waste is generated in Ukraine each year. No system is in place for monitoring Ukraine's annual generation of waste in liquid, suspension, dust, or gas form. The dumps at Ukraine's mining, metallurgical, coal, and chemical enterprises and open pits from which building materials have been recovered have amassed more than 20 billion metric tons of industrial waste that now occupies more than 55,000 hectares of land, including farmlands and pastures. At present, Ukraine recycles only 12 percent of the industrial waste generated within it in a year (whereas the EEC countries recycle 60-65 percent). Considering the amounts of different types of industrial waste that are being recovered throughout the world, Ukraine's industrial waste represents a big untapped resource. Developing the industrial waste generated at specific enterprises throughout Ukraine will require the development of a comprehensive system for monitoring the said waste. The following is a tentative list of the elements that should be included in any such monitoring system developed: 1) a total ecological-technological study of industrial waste at all enterprises in the industrial, construction, transportation, and agriculture sectors; 2) selective sampling and warehousing of industrially valuable waste in specially prepared repositories; 3) continuous implementation of engineering measures to achieve long-term storage of valuable waste with consideration for ecological safeguarding near storage sites and the development of a way to quickly transport waste to enterprises where it will be used; 4) development of a system for monitoring (including the taking of test measurements) the physical and chemical condition of warehousing facilities over time; 5) introducing a system of computerized accounting and documentation to monitor facilities where industrial waste is being accumulated; and 6) marketing secondary mineral resources. References 11: 9 Russian, 2 Western.

Continuous Laser Monitoring of Iron Ions in Water

957A0189E Kiev EKOTEKHNOLOGII
RESURSOSBEREZHENIYE in Russian No 2,
Mar-Apr 94 (manuscript received 22 Feb 93) pp 76-80

[Article by V.V. Teselkin, L.Ya. Pepetyuk, and I.G. Vakhnin, Colloidal Chemistry and Water Chemistry Institute, Ukrainian Academy of Natural Sciences; UDC 66.015.024]

[FBIS Abstract] Iron compounds and iron ions are frequently encountered in natural, ground, and waste waters. Requirements regarding maximum permissible concentrations [MPCs] of iron in water vary depending on the purposes for which the water is to be used. Water intended for household and drinking purposes cannot have an iron/iron ion concentration exceeding 0.3 mg/dm³, whereas water used to manufacture artificial fibers must have an iron content of ≤ 0.2 mg/dm³. Existing methods of testing water for the presence of iron ions in the aforesaid concentrations, i.e., methods involving the

use of sulfosalicylic acid, are not recommended because of the large errors associated with them and because their results can be influenced by the other impurities present in water. One promising way of more accurately measuring the concentration of iron and/or iron ions in water at the aforesaid concentration levels involves the use of lasers. A laboratory laser unit for continuous monitoring of the concentration of iron ions in water was developed that is based on the scattering of monochromatic radiation and the use of a finely dispersed solid-phase dark blue dye into water samples undergoing testing. The monochromatic radiation is not measured as it moves forward but rather when it is scattered at some specified angle. This is accomplished by adding either a dye or kaolin suspension to the test water solution. The amounts of dye, dispersed solid-phase particles, and salts in the solution are determined by a system of three linear equations with three unknowns. The experimental unit developed for conducting the laser monitoring includes a tank to hold the water undergoing testing, a tank holding a finely dispersed kaolin suspension, a mixer, a device to add measured amounts of reagent to the test water, a tank to hold the dyed sulfosalicylic acid reagent, a tank to hold the dye, valves to regulate the water flow rate, a PL-1 laser densimeter, and a storage tank. Tests of the laboratory laser unit and monitoring method established that the new method makes it possible to increase the sensitivity of detecting iron ions in water severalfold. It was suggested that the new laser measurement system be used to continuously monitor the levels of iron ions in water entering a process train by having a portion of the incoming flow pass through a bypass line along which the laser unit has been set up. It was further stated that the laser unit could be used to determine the concentrations of other metal ions in water by using multiwave and frequency-tuned lasers. Figure 1, tables 2; references 4 (Russian).

Trihalogen Ethers—Promising Reagents in the Synthesis of Polyfunctional Crown Compounds

957A0192A St. Petersburg ZHURNAL
ORGANICHESKOY KHIMII in Russian Vol 29 No 11,
Nov 93 (manuscript received 10 May 93) pp 2290-2294

[Article by A.L. Shabanov, Ch.I. Mamedov, Y.R. Beger, and L.V. Guseinova; UDC 547.4.314+547.898]

[FBIS Abstract] A method has been developed for synthesizing chloromethyl and alkyl derivatives of dibenzo-18-crown-6 ether based on trifunctional aliphatic compounds, namely, 1-chloromethyl-2, 2'-dibromodiethyl ethers. First, three trihalogen ethers were synthesized by the usual method, and 2, 2'-(bis-*o*-hydroxyphenoxy)diethyl ether was obtained as described elsewhere. Next, 6-chloromethyldibenzo-18-crown-6 (compound 1) was produced as follows. First, 2, 2'-(bis-*o*-hydroxyphenoxy)diethyl ether (0.05 mol), caustic soda (0.1 mol), and 1-butanol (150 ml) were mixed and boiled until the alkali had completely dissolved. A solution of dibromoether in 30 ml of 1-butanol was added to the mixture over a

2-hour period. After the mixture had been boiled for an additional 20 hours and cooled to 74°C, 1 mol of hydrochloric acid was added to it to lower its pH to 4-5, the 1-butanol was distilled off, and the volume of reaction mixture was replenished by continuously adding distilled water to it. The distillation process was continued until the temperature of the vapors reached 100°C. The reaction mixture was cooled, and the resultant thick brown mass was separated and treated with boiling octane and cooled. After the mixture had cooled, colorless crystals of crown ether (formula, $C_{21}H_{25}ClO_6$) were separated out. After repeated crystallization from octane, they were found to have a melting point of 154-155°C. The compounds 6-methyl-8-chloromethyldibenzo-18-crown-6 (formula, $C_{22}H_{27}ClO_6$; melting point, 137-138°C) (compound 2) and 6-butyl-8-chloromethyldibenzo-18-crown-6 (formula, $C_{25}H_{33}ClO_6$; melting point, 92-93°C) (compound 3) were then produced in an analogous manner from the respective tetrahalogen ethers and bisphenol. Two polyfunctional crown compounds, i.e., 6-(3,4-dicarboxy-2-thiabutyl)dibenzo-18-crown-6 (formula, $C_{25}H_{30}O_{10}S$; melting point, 118-119°C) (compound 4) and 6-[2-hydroxy-2, 2'-di(carboxymethyl)acetoxymethyl]-dibenzo-18-crown-6 (formula, $C_{27}H_{32}O_{13}$; melting point, 112-114°C) (compound 5) were produced by reacting compound 1 with mercaptosuccinic and citric acids in the presence of KOH in dioxane. The IR spectra of compounds 1 through 3 indicate that the compounds do not contain hydroxyl groups but do have narrow absorption bands indicating the bonds Ar-O-Alk and Alk-O-Alk. The absorption bands of compounds 1 through 3 also indicate that they contain aromatic rings. The IR spectra of compound 5 contained the absorption bands indicative of the presence of carboxyl groups, and the IR spectra of compound 4 contain an absorption band characterizing the presence of a C-S bond. When they were produced in the form of solid films by vacuum deposition, compounds 4 and 5 selectively and reversibly bound ammonia molecules with a detection sensitivity of 5×10^{-4} to 3×10^{-3} mg/l. The said compounds were therefore recommended as highly selective ammonia sensors. Table 1; references 6: 4 Russian, 2 Western.

3'-(2-Tetrazolyl)-2',3'-Dideoxythymidine

957A0192B St. Petersburg ZHURNAL
ORGANICHESKOY KHIMII in Russian Vol 29 No 11,
Nov 93 (manuscript received 15 Dec 93 [as published])
pp 2333-2334

[Article by V.A. Ostrovskiy, N.V. Ivanova, A.A. Malin, M.B. Shcherbinin, V.S. Poplavskiy, and Ye.P. Studentsov, St. Petersburg State Technological Institute; UDC 547.963.3:547.796.1:615.281]

[FBIS Abstract] The compound 3'-(2-tetrazolyl)-2',3'-dideoxythymidine (henceforth referred to as compound 2) was synthesized and studied in an effort to find new azidothymidine [AZT] analogues for use in treating

human immunodeficiency virus [HIV]. Compound 2, which was previously unknown, was produced in a two-step synthesis process. In stage 1, 5'-O-benzoyl-2, 3'-anhydrothymidine was reacted with triethylammonium tetrazolate to produce 5'-O-benzoyl-3'-(2-tetrazolyl)-2',3'-dideoxythymidine (compound 1). In step 2, removal of the benzoyl shield in position 5' of compound 1 resulted in compound 2. The specifics of the reaction process were as follows: Compound 1 was produced by heating 20 g (0.05 mol) of 5'-O-benzoyl-2, 3'-anhydrothymidine, 5.04 g (0.072 mol) of tetrazole, and 10.08 g (0.072 mole) of triethylamine for 40 hours at 100°C in an 85:15 solution of O-(2, 4-dichlorophenyl)-O-methyl isopropylphosphoramidothioate dimethylol propionic acid [DMPA] and dioxane. The reaction mass was cooled, the sediment was filtered off, and the filtrate was evaporated in the vacuum of a water stream pump. The residue was dissolved in 400 ml of chloroform, rinsed with water, and dried with anhydrous magnesium sulfate. The solution was filtered, 500 ml of chloroform was added to the filtrate, and the filtrate was then passed through a layer of L40/60 silica gel (Chemapol). The chloroform was removed on a rotary evaporator, and the residue was crystallized from ethanol. Compound 1 was produced in a 30 percent yield (7.2 g) and demonstrated to have a melting point of 182-185°C. Its infrared, 1H nuclear magnetic resonance [NMR], and mass spectra were recorded and presented. Next, compound 2 was produced from 9.15 g (0.023 mole) of compound 1 and 26 ml of a 33 percent solution of aqueous dimethylamine in 65 ml of methanol. The solution was mixed for 10 minutes at 25°C, after which it was heated for 40 minutes at 60°C. The solution was evaporated on a rotary evaporator, 400 ml of water was added to the residue, and the resultant solution was evaporated to 1/3 of its original volume. The latter procedure was repeated three times. After the solution had cooled, the precipitated crystals were recrystallized from water by adding activated charcoal. Compound 2 was produced in a yield of 37 percent (2.5 g) and demonstrated to have a melting point of 170-172°C. Its infrared, 1H NMR, and mass spectra were also recorded and presented. Figure 1; references 4: 1 Russian, 3 Western.

Structure-Functional Organization of Natural Peptides

957A0195B Moscow USPEKHI KHIMII in Russian
Vol 63, No 11, Nov 94 (manuscript received 25 Aug 94)
pp 1004-1026

[Article by Ye. M. Popov, Moscow State Correspondence Food Industry Institute; UDC 547.963:541.6]

[FBIS Abstract] In studying natural oligopeptides and proteins, researchers are confronted with four fundamental problems. First is determination of the chemical structure of the compound, especially the sequential order of standard amino acids in the peptide chain. Next is the identification of the spatial shape and conformational dynamics of the molecule according to known

amino acid sequence. Third is the interrelationship between the biological and physiological properties of the peptides and their molecular-structural organization. The fourth task is examination of these compounds from the evolutionary standpoint, where all the preceding information is integrated and concepts are formed concerning three-dimensional structure, functions, and the evolution of natural peptides and proteins. This scheme encompasses all research trends and classifies them by groups to form a closed cycle. In the present work the basis for such an approach is presented and the principles of structural and structure-functional organization of molecules of natural oligopeptides are examined. On the basis of angiotensin as an example, the approach to the study of the biological activity of peptide hormones from structure to function are discussed. It is demonstrated that the polyfunctionality of the peptides results from their ability to assume numerous conformational states under physiological conditions. An individual peptide function becomes realized as a result of its own characteristic conformation. A method is proposed for predetermined construction of synthetic analogs whose spatial structure conforms to the aggregate of low energy and physiologically active conformation states of a natural hormone. Figures 4; tables 7; references 104: 45 Russian, 59 Western.

Photo-Physical Properties of Polymers With Conjugated Bond Systems and Using Them in Light Energy Conversion Processes

957A0196A Kiev *TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA* in Russian Vol 30, No 5, Sep-Oct 94 (manuscript received 14 Jul 94) pp 241-263

[Article by V. D. Pokhodenko and N. F. Guba, Physical Chemistry Institute imeni L. V. Pisarzhevskiy, Kiev; UDC678.01:535.37:535.376:537.312.5:621.383.51]

[FBIS Abstract] The development of new organic electrically conducting polymers (EPP) having a system of conjugated double bonds together with all of their properties is one of the most pressing tasks in modern chemistry and molecular materials handling. Among the characteristics which attract special attention to EPP are their inherent semiconductor properties and high metal-like electrical conductivity. After taking into consideration the fact that the number of already available organic EPP, and especially those still possible exceeds the number of known inorganic semiconductors, as well as the possibility of altering their properties by varying the chemical structure, it is no wonder why many scientists and practitioners consider organic EPP as one of the most promising materials in the near future. Thus, along with studying the properties of EPP (spectral, magnetic-resonance, photo and electro-physical and electro-chemical), studies have been made of their possible applications as substitutes for inorganic semiconductors and metals in electronic components and systems for converting light energy. The present work is a review on

the photo-physical properties of EPP and their possible use in light energy conversion processes. Analysis of the literature demonstrates that various conjugated polymers are capable of manifesting the properties of a dielectric, a semiconductor, or a metal and are characterized with effective photo transmission, photo- and electro-luminescence. In a number of examples it is shown that conjugated polymers could be used as photoconductors, electro-photographic materials, laser materials, electro-luminescent diodes, as well as solid state converters of light energy. Figures 9; tables 6; references 267: 39 Russian, 128 Western.

Monomolecular Layers and Langmuir-Blodgett Films Based on Amphiphilic Macrocyclic Complex of Nickel (II)

957A0197A Kiev *TEORETICHESKAYA I EKSPERIMENTALNAYA KHIMIYA* in Russian Vol 30, No 1, Jan-Feb 94 (manuscript received 18 Feb 94) pp 45-49

[Article by T. V. Snopok, I. M. Maloshtan, B. A. Snopok, A. P. Filippov, and Ya. D. Lampeka, Physical Chemistry Institute imeni L. V. Pisarzhevskiy, Kiev; UDC539.216.2+541.49:546.74]

[FBIS Abstract] Development and study of molecular-organized systems is one of the most active trends in modern physical chemistry, since it provides the basis for creating an essentially new generation of molecular electronic devices, "nano-technology." From the standpoint of simplicity and effectiveness, the most attractive method for obtaining organized sub-molecular structures is the Langmuir-Blodgett technique which consists of forming ordered layers of amphiphilic molecules on the surface of a liquid sub-phase which is then transferred to a solid substrate. Organic molecules are frequently used in preparing Langmuir-Blodgett films, while metal-complex compounds are less studied. Nevertheless, the latter are interesting since they contain both organic and inorganic components which leads one to expect specific optical, electrical, electrochemical, and other properties. In the present work a study was made of the behavior of nickel (II) complex with an amphiphilic macrocyclic ligand, 6-n-octadecyl-1, 4, 6, 8, 11-pentaazyltetradecane, on the surface of water employing the Langmuir-Blodgett technique to transfer films of this compound on to a glass substrate, with and without an electrically conducting covering (SnO₂). Some optical characteristics of the resulting sandwich structure were studied. Figures 2; references 8: 5 Russian, 3 Western.

Determination of Impurities in Initial Substances for Preparation of HTSP-Materials

957A0201A Moscow *VYSOKOCHISTYYE VESHCHESTVA* in Russian No 2, Mar-Apr 94 (manuscript received 21 Oct 94) pp 138-142

[Article by E. S. Zolotovitskaya, L. V. Glushkova, Ye. I. Panova, R. F. Ramakayeva, Z. V. Shtitelman, and A. B. Blank, Single Crystals Institute, Kharkov; UDC543.42:531.9]

[FBIS Abstract] The presence of impurities has a significant effect on the electro-physical and mechanical properties, resistance to external action, and the kinetics of solid phase synthesis of HTSP-ceramics. Published literature has little data on the sources of this contamination. Evidently, these extraneous impurities originate from source materials and during the prolonged solid phase synthesis process itself. In the present work multi-element atomic emission spectrum analysis, employing both arc and plasma excitation means, were used to determine impurities in HTSP-ceramics resulting from copper and bismuth oxides, and calcium, strontium, and barium carbonates at detection limits ranging from 10^{-6} to 10^{-4} percent by weight. Rare earth elements were omitted since they are assumed to be of sufficiently high quality, as confirmed by certification. The study demonstrated that the accumulated impurities in finished ceramic products result mostly from the structural materials in the equipment used to make the ceramics and the process conditions. The techniques developed in this work may be used to evaluate the quality of starting products used in preparing HTSP-ceramics. Tables 2; references 7 (Russian).

Estimating Quality of Polycrystalline Germanium by Electro-Physical Methods

957A0201B Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 2, Mar-Apr 94
(manuscript received 28 Jul 92) pp 148-154

[Article by Ye. A. Petrova, N. B. Tyurina, P. Yu. Karasev, I. N. Voronov, S. B. Prokhorov, V. A. Artemova, M. A. Morokhovets, Rare Metal Industry SR and Design Institute; UDC546.289:53.082.7]

[FBIS Abstract] Quality control of the initial material has great significance in the technology of preparing ultra-pure germanium. Accordingly, proper evaluation and compounding of the initial materials determine to a large extent the possibility of obtaining germanium having differential impurity concentrations on the level of 10^{10} to 10^{11} cm⁻³ both in zonal cleaning and in crystal growth by the Chokhralskiy method. The quality of initial germanium, as prepared in the polycrystalline form, is normally determined by specific electrical resistance measured at various ingot temperatures, or by the concentration of charge carriers at 77K determined holistically from plates and single blocks, and also indirectly by concentration of carriers in single crystals grown from polycrystalline germanium. In the present work applicability limits were determined for various electro-physical methods for estimating the quality of polycrystalline germanium. Electro-physical parameters were compared at 77-300K for polycrystalline plates and single blocks cut from them, as well as polycrystalline samples having different block densities. Specific electrical resistivities were compared at 213 and 77K. It was demonstrated that block limits introduce acceptor sites with energies ranging from 215 meV to less than 65 meV. Estimating the quality of polycrystalline germanium

having a specific resistivity at 77K of less than 100 Ohm-cm is possible by indirect measurement of ingots of a higher Ohmic material only by measuring single blocks. Figures 5; references 6: 4 Russian, 2 Western.

Ultrapure Chalcogenide Glasses for Fiber Optics

957A0202A Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 4, Jul-Aug 94
(manuscript received 14 Mar 94) pp 12-20

[Article by M. F. Churbanov and I. V. Skripachev, Chemistry of Ultrapure Substances Institute, Nizhniy Novgorod; UDC546.19'23:666.1]

[FBIS Abstract] Chalcogenide glasses as optical materials have been known for about 40 years, while the first reports on their use as optic fibers appeared in the 1960's. Research on these glasses as materials for fiber optics in the middle infra-red region has been intensively pursued for the past 10-15 years, and the results have confirmed the effectiveness of using them in optical devices. At the same time, problems concerning the preparation of ultra-pure chalcogenide glasses, the fabrication of light conductors from them having low optical losses, and practical applications have become more pronounced. Clarity in the infra-red region, a property critical for a glass to be used in fiber optics, depends heavily on the degree of purity of the glass. The present work contains a review of previously published and new data on the effects of impurities on optical losses in chalcogenide light conductors using systems As-S, As-Se, Ge-As-Se, and As-Se-Te as examples. Some of the results obtained and difficulties still remaining at the current stage of development are considered. Figures 4; table 1; references 26: 14 Russian, 12 Western.

Fabrication of Doubled Layered Light Conductors From Ultra-Pure Glass Systems As-S, As-Se, and Ge-As-Se

957A0202B Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 4, Jul-Aug 94
(manuscript received 14 Mar 94) pp 34-41

[Article by I. V. Skripachev, V. G. Plotnichenko, G.Ye. Snopatin, A. A. Pushkin, and M. F. Churbanov, Chemistry of Ultra-Pure Substances Institute, Nizhniy Novgorod, General Physics Institute, Moscow; UDC621.396.22.02:535.8]

[FBIS Abstract] Prior to the 1980's, development of fiber optics of the middle infra-red range for the 2-12 micron region was largely hindered by the lack of ultra-pure chalcogenide glasses. The first fibers for the infra-red range obtained in the 1960's had high optical losses in the order of 20 dB per meter in the 5-6 micron range. Intensive development in the preparation of ultra-pure chalcogenide glasses began at the start of the 1980's, and in 1981 selenide glasses were obtained with as losses as low as 56 dB per km. This stimulated development and in 1982 sulfide- and selenide-arsenic glasses were

obtained with losses of less than 1 dB per meter, and in 1984 it was reported that a single layer optical fiber was prepared from a sulfide-arsenic glass with a minimal optical loss of 35 dB per km at 2.4 microns wavelength. After the impressive successes of the 1980's, further gains in lowering the losses in infra-red light conductors made of chalcogenide glasses proceeded more slowly, while the difference between achieved and theoretically estimated level of optical losses comprises not less than 1-2 orders. This is due to both to an insufficiently high degree of purity in the initial glass and to unsatisfactory technology in preparing optical fibers from these glasses. In the present work results are presented on the optical properties of fiber optics prepared from the ultra-pure glasses of the title systems. Minimal optical losses in light conductors having a step-wise profile in refractive index of ultra-pure sulfide-arsenic glass comprised 23 +/- 8 dB per km at 2.3 micron wavelength. Minimal losses in selenide-arsenic glasses do not exceed 95 dB per km in the 2.5-3 micron range and 4 dB in the 10-11 micron region for glass fibers of the Ge-As-Se system. Figures 5, table 1; references 10: 5 Russian, 5 Western.

Contemporary and Future Areas of Application of Infra-Red Light Conductors

957A0202C Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 4, Jul-Aug 94
(manuscript received 14 Mar 94) pp 42-52

[Article by V. G. Plotnichenko, General Physics Institute, Moscow; UDC546.19]

[FBIS Abstract] Achievements in fiber optics as a new trend in science and technology are closely related to the excellent optical and mechanical properties of ultra-pure quartz glass and to the successful developments in fabricating light conductor fibers with low optic losses from them. By the start of the 1970's quartz glasses having almost theoretically minimal optic losses approaching 0.2 dB per km at 1.55 microns wavelength were available. In the 1980's theoretical evaluations were made on the effects of various mechanisms on the total optical losses in these materials. The most promising appeared to be thallium, silver, and cesium halides, as well as fluoride glasses. Other than the search for ultra-low optic losses achievements were also made in laser technology and medicine which required the development of powerful infra-red radiation (initially with CO₂ lasers and later with Er:YAG laser). The present work is a brief review of the basic achievements in infra-red light conductor fibers which also discusses some trends in contemporary and future applications of these conductors such as contact-less measurement of temperature, heat control in biological processes and micro-electronic components, transmission of infra-red images, and sensors for electric and magnetic fields. Figures 9; table 1; references 19: 11 Russian, 8 Western.

Development of Research on Creating New Membranes and Membrane Processes

957A0204A Kiev KHIMIYA I TEKHOLOGIYA
VODY in Russian Vol 16, No 2, Mar-Apr 94,
pp 220-221

[Article by M. T. Bryk, Doctor of chemical sciences]

[FBIS Translated Text] On 21-23 September 1993, in the town of Slavsko (Lvovskaya Oblast), the VIII Ukrainian seminar on membranes and membrane technology was held, at which problems were examined on the development of research on the creation of new types of membranes and membrane processes. At the seminar it was noted that over the past 3-5 years in various scientific centers research was intensively pursued on the creation of new membranes and membrane processes, which significantly broadens not only knowledge, but also facilitates a wider distribution of membrane technology throughout various areas of human activity.

More than 50 scientists and researchers from Ukraine (Kiev, Kharkov, Lvov, and other cities) and Russia (Moscow, Voronozh) participated in the work of the seminar, at which 12 plenary reports and 15 standing reports were presented.

In the form of a review, M. T. Bryk (Kiev) gave an analysis of the status of research conducted during the past 3-5 years on the creation of new membranes and membrane processes in Kiev as well as in foreign scientific centers. The report focused intently on research on the creation of charged, nano-filtration, "pervaporation-sionny" [per-vaporization?] membranes, and membranes having supplemental functions. Amongst the new membrane processes attention was paid to prospects from the practical point of view of processes employing nano-filtration, membrane distillation, reagent-assisted ultrafiltration, membrane biocatalysis, etc.

A report attracting great interest was that of Doctor of Chemical Sciences S. S. Minko (Lvov) which was devoted to the development of a polymerization method of forming composite membranes having a pre-determined macro-structure from monomers or oligomers capable of photopolymerization in thin layers. From the presentations it became clear that this method could be very promising in the development of new types of membranes, as well as in broadening the number of polymers from which membranes may be obtained.

In a report by Prof. O. V. Suberlyak (Lvov) an analysis was made of the results of work done by him and a Chair at Lvov Polytechnical University headed by him on the creation of high hydrophilic gel membranes, which are finding applications in various areas but mainly in medicine.

The report of V. D. Grebenyuk (Kiev) was devoted to the possibilities of using membrane processes to resolve ecological problems, particularly treating effluents from

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electroplating production to remove non-ferrous and heavy metals, as well as stack gases from thermal electric power plants.

In both oral and standing reports, Prof. M. V. Tsebrenko (Kiev) examined a number of problems related to research and development of ultra-fine fiber filters based on polymeric mixtures, including water-soluble polymers. These filters, designed to treat liquids and gases for fine suspensions (to 0.3-0.5 microns), found applications in biotechnology, food, chemical-pharmaceutical, and photo-cinematic industries.

A report by Prof. V. A. Bomko (Kharkov) was devoted to the complex problem of creating production of tracking (nuclear) membranes in Ukraine. Membranes such as these of polyethylene terephthalate (lavan) found applications in finished water treatment in biotechnology, radio-electronics, and other branches of industry. It was noted that it is very important to assimilate other polymeric films to obtain tracking membranes, which would significantly broaden their applications. This is a rather complex problem for practical resolution, since radiolysis and the subsequent chemical etching of many polymers is not sufficiently effective.

New membrane processes, particularly membrane distillation and the possibility of using it to concentrate aqueous solutions were considered in a report by R. R. Nigmatullin (Kiev).

Still another new variant of the membrane method, reagent-enhanced ultrafiltration, as demonstrated in a report by V. M. Kochkodan (Kiev), is very promising for ultrafiltration of electroplating effluents to remove non-ferrous and heavy metals.

The use of biopolar membranes to obtain acids and bases by electrodialysis was the theme of a report by V. I. Kovalchuk (Kiev), while certain theoretical problems in mass transfer through ion exchange membranes were examined in a report by N. I. Zharkikh (Kiev). Problems on the modification and synthesis of membranes containing an ion exchange group were reflected in reports by A. F. Melnik, Ye. G. Sivalov, V. D. Grebenyuk and coworkers (Kiev), V. V. Frolov (Moscow), and others.

The applied aspects of utilizing membrane processes in various specific technological processes were examined in reports by A. P. Semik (Kiev), I. P. Sapon (Kiev), Yu. G. Yurov (Kiev), G. V. Slavinskiy (Voronezh), V. I. Skorokhody (Lvov), Ye. V. Talantsev (Moscow), and others.

In the presentations and discussions at the seminar it was noted that the problem of the development of research on the creation of new membranes and the development of new membrane processes is very important in determining further routes to the development of this branch of chemical science in Ukraine.

It was decided to conduct the next IX seminar in 1994, and the III Ukrainian Conference on membranes and membrane technology in 1995.

Within the framework of the seminar the board of directors of the Ukrainian Membrane Society was authorized to meet at a gathering at which the president of the society, M. T. Bryk, will present information on the activities of the society. Questions concerning the future activity of the society, particularly in the field of scientific and technical information and assistance in broadening the introduction of membrane technology to various spheres of human activity were examined. A position was also taken on the matter of members' fees of the Ukrainian Membrane Society.

New Data on Platinum Group Metal Content in Iyolite-Carbonatitic Rock Series (Guli and Kugda Massifs, Maymecha-Kotuysk Province, Polar Siberia)

957A0211A Moscow GEOKHIMIYA in Russian No 11, Nov 94 (manuscript received 26 Jun 94) pp 1568-1576

[Article by L. N. Kogarko, A. V. Ukhonov, and I. Ye. Nikolskaya, Geochemistry and Analytical Chemistry Institute imeni V. I. Vernadskiy, Moscow; UDC550.4]

[FBIS Abstract] The presence of platinum in central type intrusive massives having a dunite core has been known since the past century. Ural massives of dunite-clinopyroxenite-gabbroid formation comprise the so-called platinum-belt. Later on, similar platinum intrusions were discovered in Alaska. Platform analogs of the Ural-Alaskan type of hyperbasites are considered concentric-zonal basic-ultrabasic massives. The elevated content of platinum metals in sulfides from carbonatitic body serve as an indicator of platinum ore in the northern region of the Siberian Platform. In the present work neutron activation assisted with micro-assay concentration was used to determine the contents of Os, Ir, Ru, Pt, and Au in successive intrusive phases of the Guli and Kugda massifs. Platinum group metals were more abundant in the early magmatic derivatives. Magmatic processes are considered to be a predominant factor in platinum group metal distribution in Iyolite-carbonatitic rock. Figures 3; table 1; references 19: 7 Russian, 12 Western.

Formation of Radiolytic Hydrogen and Estimating Parameters of Explosion in Hydrogen-Steam-Oxygen-Nitrogen Mixtures in Primary Circuit Components of Water-Water 1000 Nuclear Reactor

957A0212A Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 28, No 5, Sep-Oct 94 (manuscript received 26 May 93) pp 389-397

[Article by O. P. Arkhipov, V. L. Bugayenko, V. K. Dushin, A. I. Zabeyda, S. A. Kabakchi, V. T. Kireyev, and Ye. I. Ruzavin, Experimental Design Bureau GIDROPPRESS, Ordzhonikidze, Theoretical and Experimental Physics Institute imeni L. Ya. Karpov, Central Machine Building SRI, Kaliningrad, Physical Chemistry SRI, Moscow; UDC541.15]

[FBIS Abstract] During 1991-92 through the joint efforts of researchers at the title organizations, a programmed complex was developed called MORAVA-N2, an acronym for MOshchnost [power], Raskholazhivaniye [cooling down], and AVariya [accident]. The purpose of the program was to describe the physical chemical processes that take place in the aqueous heat carrier of the primary circuit in water-water type nuclear reactors. The complex makes it possible to calculate the dynamics of change in the concentration of impurities such as oxygen, ammonia, hydrazine, alkali, and boric acid, as well as products from ionizing radiation, interacting with the heat carrier. In the present work a mathematical model was used in this program to demonstrate that formation of hydrogen-containing vapors in components of the primary circuit is possible only when the reactor is in a transitional mode, such as a cool-down or shut-down. Compositions of gas bubbles arising under the cover of a water-water 1000 reactor, in the steam generator collectors, and in the pressure regulator during departures from normal conditions of cooling and cold shut-down were calculated. An analysis was made of the possibility of detonation of the gas mixture in bubbles in the event of a compression impact in the circuit. For this type of detonation, an algorithm is proposed to calculate the criteria for detonation of gas mixtures in the primary circuit components of this type water-water reactor design. Figures 4; tables 2; references 17: 14 Russian, 3 Western.

Role of Non-Equilibrium in Thermodynamics of Ultra-Fine Powders

957A0212B Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 28, No 5, Sep-Oct 94 (manuscript received 17 May 93) pp 418-421

[Article by E. I. Asinovskiy and L. S. Polak, High Temperatures Institute, Moscow, Petrochemical Synthesis Institute imeni A. V. Topchiyev, Moscow; UDC541.182.3:(536.7+541.12)]

[FBIS Abstract] In a previous work a thermodynamic model of dimensional effects of ultra-fine titanium nitride powder was presented. Relationships of particle size to thermodynamic stability and temperature of initiation of sintering were observed. These relationships included density and surface tension, the latter computed from the decrease in lattice period with drop in particle size. However, the mechanism for generation of surface tension remains unclear. In the present work the mechanism for the generation of excess surface tension in titanium nitride powders is examined. It is demonstrated that it may be related to the existence of a radial gradient in excess vacancy concentration within the particles. The most probable cause for this gradient is the short cooling time of the particles in the reactor. The proposed model describes the experimental data on the relationship of lattice period to particle size and sintering temperature. Figures 5; references 14: 11 Russian, 3 Western.

Radiation Treatment of Water for Cyanides

957A0212C Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 28, No 5, Sep-Oct 94 (manuscript received 13 Nov 92; after revision 28 Jan 94) pp 470-472

[Article by I. M. Piskarev, A. Ye. Tylova, and A. I. Sevastyanov, Nuclear Physics SRI imeni D. V. Skobeltsyn; Moscow State University imeni M. V. Lomonosov, Moscow; UDC541.15]

[FBIS Abstract] In deriving gold, the ore is treated with 0.05 percent solution of sodium cyanide and the gold enters the solution as sodium cyanoaurate. However, in addition to gold and sodium cyanide, the solution also contains numerous other metals, such as calcium, cobalt, copper, magnesium, zinc, iron, nickel, and others as cyanide complexes. After extracting the gold, the slurry contains 150-200 mg per liter of sodium cyanide, and in view of its high toxicity, this solution must be treated to bring the cyanide concentration down to an acceptable level of 0.05 mg per liter. Although chemical methods exist for this purpose, they are lengthy and the process is unstable. Moreover, it introduces HCl. The cyanide ion may also be decomposed by treating the slurry with ionizing radiation. In the present work tests were conducted on plant effluents (solutions and slurry). Mildly alkaline (pH 9), neutral (pH 6.5-7.5), and acid (pH 1-1.2) solutions were subjected to radiation (1.5 kGr per hour) under various conditions. An empirical formula was derived for the experimental data which may be used for practical considerations in treatment facilities. Figure 1; table 1; references 3 (Russian).

Ionic-Molecular Reactions During Step-Wise Photoionization of Benzene and Toluene

957A0213A Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 28, No 3, May-Jun 94 (manuscript received 10 Mar 93) pp 204-206

[Article by V. M. Matyuk, I. N. Pobezhimova, and V. K. Potapov, Physical Chemical SRI imeni L. Ya. Karpov, Moscow; UDC541.141.7]

[FBIS Abstract] In connection with studying the mechanism of chemical action of UV laser radiation on molecular organic systems, it appeared to be interesting to describe the overall scheme of excitation energy deactivation by mono-molecular and colliding channels during step-wise photoionization of molecules. Previously, it was demonstrated that dimeric benzene molecules are more effectively formed in the absence of vibrational excitation energy of primary molecular ions obtained in single-quantum monochromatic VUV-photoionization processes. In vibrational excitation, the effectiveness of forming ions decreases by almost an entire order. This is related to the emergence of an intermediate complex whose stability is affected by excitation of the initial molecular ion. Under the conditions of step-wise photoionization of molecules by UV laser pulses, a possibility arises for introducing a competing internal channel of

molecular ionic deactivation resulting in dissociation. In the present work reaction rate constants and mechanism were studied for ionic-molecular reactions with participating benzene and toluene ions formed during di- and tri-quantum molecular photoionization. In reactions of formation of dimeric cations by the tri-molecular mechanism of vibrational energy, ionic excitation lowers the rate constant of the process. Electron-excited molecular benzene ions participate in two parallel processes—ion dissociation and colliding deactivation of the excited state. The kinetic activation energy of the primary ions (to 4 eV) has no effect on the rate constant of either reaction. Figures 2; references 6: 2 Russian, 4 Western.

Role of High Temperature Static Broadening of Levels on Kinetics of Impact-Wave Ionization of Monatomic Gases by Electrons

957A0213B Moscow *KHIMIYA VYSOKIKH ENERGIY in Russian Vol 28, No 3, May-Jun 94 (manuscript received 29 May 92) pp 207-211*

[Article by N. M. Kuznetsov and I. A. Aliyeva, Chemical Physics Institute imeni N. N. Semenov, Moscow; UDC533.9.082.5]

[FBIS Abstract] Ionization of monatomic gases in shock waves, far from a state of ionization equilibrium, proceeds under conditions of unequal temperatures of electrons and heavy particles (atoms and ions). Even at very great wave intensities, such as those at the start of the relaxation zone, electron temperatures remain relatively low, and even a slight change in excitation energy of the first electron level of an atom markedly changes the rate constants for electron excitation and step-wise ionization. It is therefore interesting to compute the ionization rate constant for atoms taking into account the broadening of level E₁ due to collisions. In the present work formulas were derived for computing the ionization rate constants for atoms with electrons and for electron temperatures at quasi-stationary stages of ionization behind a shock wave front taking into account the dependence of electron terms on interatomic distance. Ionization rate constant was found to increase as a result of a nearing or overlapping of these terms. Quantitative computations were made for xenon. Figures 3; tables 1; references 6: 4 Russian, 2 Western.

Study of Composition of Electrode Layer in Direct Current Discharge by Mass Spectrometry of Molecular Bundle

957A0213C Moscow *KHIMIYA VYSOKIKH ENERGIY in Russian Vol 28, No 3, May-Jun 94 (manuscript received 28 Dec 92) pp 266-270*

[Article by V. K. Smirnov, E. N. Kotikov, and L. N. Gorokhov, Microelectronics Institute, Yaroslavl; High Temperatures Institute, Moscow; UDC537.924]

[FBIS Abstract] Plasmachemical etching of solid body surfaces is under intense investigation owing to its many applications in modern technology. The composition of the ionic and neutral components in plasmachemical etching systems is varied and its determination is especially significant. The most effective means for this purpose appears to be mass spectrometry using a collector placed in the main stream of a reactor outfeed. By this means it is possible to record the stable neutral molecules present in the discharge. Drawing the sample in the form of a molecular bundle makes it possible to determine both neutral (including radicals) and ionized components of the plasma. In the present work the ionic and neutral compositions of the electrode layer in a direct current discharge of sulfur hexafluoride using aluminum and tungsten cathodes was studied by the above method of mass spectrometry of molecular bundles. Sulfur hexafluoride was identified for the first time as a plasma component by combining the recording of effective ionization curves with the synchronous detection technique. Composition of the ionic component of the electrode layer in the plasma is determined by a combined aggregate of processes involved in the interaction of plasma components with the cathode surface and reflects both the surface composition and those phenomena brought on by bombardment of this surface with ions accelerated in the electrode region. Figures 2; tables 1; references 19: 8 Russian, 11 Western.

Effect of Bismuth Additions on Structural Phase Transitions in High Temperature Superconductor Y-Ba-Cu-O by Exo-Emission Data

957A0225A Moscow *VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2—KHIMIYA in Russian Vol 35, No 2, Mar-Apr 94 (manuscript received 9 Sep 93) pp 147-154*

[Article by I. V. Krylova, Chair of Physical Chemistry; UDC537.533.2:537.312.62:541.124]

[FBIS Abstract] The relationship between structural instability and high critical temperature in superconductors has not yet been resolved. High temperature superconductors Y-Ba-Cu-O containing bismuth and having a critical temperature of about 100K form a new group of superconductor materials that are promising for use in superconductor devices. Superconducting ceramics containing various amounts of bismuth have been synthesized and it was established that at certain bismuth concentrations the parameters of the nucleus are rhombic and that the critical temperature at which the ceramic becomes a superconductor passes through a maximum. However, data on the electro-physical parameters of the above system doped with bismuth, and especially concerning the surface electron properties, are lacking. In the present work a study was made of the low temperature (293-77K) exo-emission from a ceramic,

high temperature, bismuth-doped, superconductor. The presence of emission current peaks was established at structural phase transition temperatures at critical temperature ranges of 160-180 and 230-240K during the course of cooling to 77K and subsequent tempering. The number and intensity of these peaks increase proportionately with the bismuth content and simultaneously with growth in critical temperature from 90 to 103K. Evidently, the introduction of small amounts of bismuth increases the structural instability of the ceramic and the number of weakly-bound electrons increases. This results in their migration to low level traps at the critical temperature. On the basis of the accumulated data, it was hypothesized that the emitted electrons become localized on the molecules (or atoms) of non-bridged weakly bound oxygen, thereby imparting a superconductor property to the ceramic. Figures 4; references 21: 19 Russian, 3 Western.

Sorption-X-Ray-Fluorescence Determination of Arsenic in Water

957A0225B Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2—KHIMIYA in Russian Vol 35, No 2, Mar-Apr 94 (manuscript received 4 Feb 93) pp 167-173

[Article by N. V. Kulagina, T. I. Tikhomirova, N. M. Sorokina, V. I. Fadeyeva, G. I. Tsizin, and Yu. A. Zolotov, Chair of Analytical Chemistry; UDC543: 541.183.123]

[FBIS Abstract] Arsenic compounds are among the most toxic contaminants in the environment, and rapid and dependable methods are needed for effective control of their contents. Many instrumental methods used for this purpose are lacking in both sensitivity and selectivity and they require preliminary sample preparation and a concentrating stage. The most rational appear to be methods which use ion exchange membranes and complex-forming sorbents in the concentrating stage. In the present work a study was made of the sorption of arsenic (V) on cellulose filters containing grafted amino groups. It was demonstrated that quantitative extraction takes place at Ph 4.0-4.5. The sorption of arsenic (V) onto the cellulose filter is apparently an ion exchange mechanism. Conditions were worked out for concentrating the arsenic under ordinary and recycling modes. Also, sorption of arsenic (III) on filters with grafted dithiocarbamate groups was studied, and conditions needed for concentration of arsenic (III) at Ph 0 were determined. Methods are presented for the sorption-X-ray-fluorescent determination of both arsenic (III) and (V) in water. Figures 2; tables 7; references 22: 11 Russian, 11 Western.

Kerosene Pyrolysis in a Tube Reactor With a Ring-Shaped Turbulizer

957A0305A Kiev EKOTEKHNOLOGII 1 RESURSOSBEREZHENIYE in Russian No 3, May-Jun 94 (manuscript received 1 Apr 94) pp 15-20

[Article by S.P. Gorislavets and V.P. Levchenko, Gas Institute, Ukrainian Academy of Natural Sciences, Kiev; UDC 665.642-986+665.633]

[FBIS Abstract] In an effort to improve the process for producing ethylene, scientists at the Gas Institute of the Ukrainian Academy of Natural Sciences developed a new type of tube reactor for kerosene pyrolysis. The new type of tube reactor was tested with kerosene produced by the Moscow Petroleum Refinery. The kerosene pyrolysis was conducted at 690-900°C in 30°C intervals with the following raw material flow rates (in kg/h) and contact times (τ) (with 100 weight percent steam added to the starting material): 0.194 ($\tau = 0.18$ s); 0.3387 ($\tau = 0.1$ s); and 0.581 ($\tau = 0.07$ s). The kerosene entering the reaction zone was heated to 540°C, and the pressure in the reaction zone ranged from 0.09 to 0.12 MPa. The maximum ethylene yield, i.e., 37.9 percent (weight), was observed at a temperature of 795°C and a contact time of 0.18 s (flow rate of raw material, 0.194 kg/h). Under the said conditions, gas formation amounted to 73.5 percent (weight). When the flow rate of raw material through the unit was increased to 0.387 kg/h ($\tau = 0.1$ s), peak ethylene yield was observed at 820°C and amounted to 32.2 percent (weight), which is 5.7 percent (weight) lower than in the experiments conducted with a raw material flow rate of 0.194 kg/h. When the raw material flow rate was increased to 0.581 kg/h ($\tau = 0.07$ s), the maximum ethylene yield (32.1 weight percent) was reached at 880°C and gas formation amounted to 66.5 percent (weight). An analogous dependence was observed for the yields of propylene and lower olefins. Thus the maximum propylene yield (13.5 weight percent) occurred at a pyrolysis temperature of 750°C and a contact time of 0.18 s, and the maximum yield of lower olefins (54.8 weight percent) was achieved with a pyrolysis temperature of 795°C. In all of the process conditions tested, the yield of hydrogen and methane increased with pyrolysis temperature. A comparison of the yields obtainable by using the new tube reactors with ring-shaped turbulizers versus those obtainable by using conventional tube reactors with smooth turbulizers confirmed that the ring-shaped turbulizers result in a much more efficient pyrolysis process. Yields of ethylene, propylene, total lower olefins, and gas in tube reactors with ring-shaped turbulizers are respectively 3.8, 5.7, 11.2, and 4.2 weight percent higher than in tube reactors with smooth turbulizers. Furthermore, because the amount of coke deposits formed when ring-shaped turbulizers are used is much lower than when smooth turbulizers are used, tube reactors with ring-shaped turbulizers can run for longer times before coke deposits need to be burned off. Furthermore, the tubes of reactors with ring-shaped turbulizers last longer because of the lower tub wall temperatures required with ring-shaped as opposed to smooth turbulizers. Figures 2, tables 2; references 3 (Russian).

Development and Investigation of Catalysts for the Process of Selective Catalytic Reduction of Nitrogen Oxides by Ammonia

957A0305B Kiev EKOTEKHNOLOGII I
RESURSOSBEREZHENIYE in Russian No 3,
May-Jun 94 (manuscript received 16 Feb 93) pp 55-58

[Article by A.D. Tereshchenko, M.G. Martsenyuk-Kukharuk, V.A. Astapyuk, S.N. Orlik, and A.P. Martsenyuk-Kukharuk, Physical Chemistry Institute, Ukrainian Academy of Natural Sciences, Kiev; UDC 541.128.13]

[FBIS Abstract] Spent liquid solutions from electroplating processes were subjected to special treatment and then used as a raw material for preparing supported catalysts for selective catalytic reduction of nitrogen oxides by ammonia. The resultant multicomponent oxide catalysts were studied in an NO-HH₃ selective catalytic reduction process with a gas flow space velocity of 15,000/h in a continuous-type reactor with a model gas mixture containing 0.05 percent (volume) NO + 0.045 percent (volume) NH₃ + 6 percent (volume) O₂ + He(N₂). The catalysts were tested with Al₂O₃ and SiO₂ as carriers. The catalysts' catalytic activity was characterized by their conversion of NO as measured by TESTO-33 (Germany) and 344-KhL-04 gas analyzers. The Fe-Cr/ γ -Al₂O₃ and Cu-Cr/ γ -Al₂O₃ catalysts tested

proved to be at least as effective in converting nitrogen oxide as the best domestic and foreign vanadium-titanium catalysts used in selective catalytic reduction. Specifically, at process temperatures of 200, 250, 300, and 350°C, the new Fe-Cr/ γ -Al₂O₃ catalyst resulted in the following NO conversion rates (the number in the denominator indicates the level of NO conversion in the presence of 0.1 percent SO₂ by volume): 95/80, 100/90, 100/100, 95/100. At process temperatures of 200, 250, 300, and 350°C, the new Cu-Cr/ γ -Al₂O₃ catalyst resulted in the following NO conversion rates: 100/95, 100/98, 100/100, 95/100. At process temperatures of 200, 250, 300, and 350°C, the foreign vanadium-titanium catalyst SCR-1 resulted in the following NO conversion rates: 77/60, 96/78, 95/85, and 82/90. X-ray photoelectron spectroscopy studies of the new Fe-Cr catalysts on Al₂O₃ and SiO₂ carriers established that the effect of both is based on a Cr⁶⁺-to-trivalent chromium reduction action. Preproduction tests of a new complex supported catalyst prepared from spent electroplating solutions in a process for scrubbing nitrogen oxides from stack gases by selective catalytic reduction at the Darnitsa Heat and Power Station (Kiev) established that more than 80 percent of nitrogen oxides can be removed from stack gases with temperatures of 310-315°C and a space velocity of 10,000-20,000/h. Tables 3; references 5: 4 Russian, 1 Western.

Environmental Pollution and Radiation Conditions in Russia in October 1994

957A0323A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 1, Jan 95 (manuscript received 26 Nov 94) pp 117-119

[Article by Z. I. Mokrousova, A. M. Ovanesyants, A. V. Lysak and N. A. Tsybikov, Russian Federal Service for Hydrometeorology and Environmental Monitoring (Rosgidromet)¹; UDC 504.3.054"1994.10"(047) (47+57)]

[FBIS Translated Text]

Environmental Pollution Resulting From Accidents

Atmospheric Air. During October no information was received concerning accidents causing atmospheric pollution in populated places.

Soils and Sea Water. As a result of an earthquake in the Kuril Islands in October and the resulting destruction of warehouses with petroleum products resulting from this there was contamination of soils and coastal sea waters. For example, on Kunashir Island an area of 5 hectares was polluted and 78.6 tons ran into Yuzhno-Kurilskaya Bay; on Shikotan Island an area of 21 hectares was contaminated and 1645 tons ran into Malokurilskaya Bay and 12 tons into Krabovaya Bay.

Water Bodies. During October 1994 there were two accidents reported which resulted in pollution of water bodies.

On 14 October pollution was discovered in the Stepnoy Zay River in the neighborhood of Zainsk (Tatarstan Republic) in the entire width of the river with white flakes of the remnants of sugar beet refining and the water had a strange odor with an intensity of 5 scale units (the maximum on the scale). The results of the analyses indicated the absence of oxygen in the Buguldinka River (a tributary of the Stepnoy Zay, on which the sugar refinery is situated), an increased content (up to 4000 mg/liter) of poorly oxidizable organic substances relative to the COD [Chemical Oxygen Demand], ammonium nitrogen—62 MAC; in the Stepnoy Zay river there was a deficit of oxygen dissolved in the water, COD up to 480 mg/liter.

The investigatory commission detected two pollution sources: Zainsk sugar refinery (Tatsakharprom) and the Zay sovkhoz (Tatarstan Republic Ministry of Agricultural Products). The accident was cleaned up on 17 October. An analysis of the samples taken on 19 October indicated a decrease in the concentration of the pollutants to a level below the MAC.

A diesel fuel spill occurred on 27 October in the Irkutsk Reservoir in the neighborhood of Patrony village, Irkutsk Oblast, during the fueling of a motor ship. According to the results of analyses made by the Irkutsk Administration of the Hydrometeorological Service, on

1 November the content of petroleum products in the accident region was 105 MAC.

Aftereffects of accident on an oil pipeline in the Komi Republic. After the receipt of information in September on the accident to the oil pipeline running between Vozey and the head structures of the AO Komineft, the Northern Administration for Hydrometeorology and Monitoring of Environmental Pollution (UGMS) of the Rosgidromet, by agreement with the Commission on Exceptional Situations of the Komi Republic, organized the frequent schedule of observations which is introduced at the time of emergency situations.

Observations at Ust-Usa station (where the Usa River flows into the Pechora) were made each three days and at Ust-Tsilma (on the Pechora) daily (under the standard program samples are taken at these points once a month).

All the collected data were handed over to local monitoring agencies.

On 30 September, as a result of a rain-induced flood, there was partial destruction of water seals accompanied by the entry of some quantity of oil into the Kolva River and surrounding swamps.

Up to 20 October no oil slick was observed at the most downstream gaging station in the Usa River basin, that closest to the accident site (Ust-Usa station, about 15 km from the entry of the Kolva River).

Beginning on 20 October, on the surface of the Usa River at the most downstream gaging station, a film of petroleum products with a width 1-5 m began to be observed and on 26 October an observer at Ust-Usa station noted an oil slick occupying the entire width of the river where it enters the Pechora. According to data from an analysis of samples taken at Ust-Usa station, the content of petroleum products in the Usa River in the second half of October did not exceed 2 MAC.

At the Ust-Tsilma gaging station situated downstream on the Pechora the content of petroleum products in October was below the MAC and no film of petroleum products was noted.

The most unfavorable situation related to the pollution of water bodies may develop in the spring of 1995 as a result of the washing away of petroleum products during the course of intensive snow melting.

Extremely High Environmental Pollution

Atmospheric Air. In October 1994 there were no cases of extremely high air pollution (exceeding the maximum one-time (mot) maximum admissible concentrations MAC_{mot} during a 20-minute observation period by a factor of 50 or more or mean diurnal (md) maximum admissible concentrations— MAC_{md} —by a factor of 30-49) (in October 1993 such cases also were absent).

Water Bodies. In October 1994 extremely high pollution (exceeding the maximum admissible concentrations by a factor of 100 or more) and sharp worsening of the organoleptic properties of water were registered in 11 cases in 5 water bodies (in October 1993 there were 20 cases in 11 water bodies).

As before, extremely high pollution levels were observed in the following rivers: Pelshma in Arkhangelsk Oblast (concentration of lignosulfonates 120 mg/liter, BOD₅—26 MAC); Neman and Pregola in Kaliningrad Oblast (hydrogen sulfide content up to 0.05 mg/liter); Nyuduy in Murmansk Oblast (nickel ions more than 300 MAC, copper ions more than 100 MAC); Miass in Chelyabinsk Oblast (hydrogen sulfide content 0.45-0.50 mg/liter).

Forest industry and metallurgical enterprises and housing-communal facilities are the pollution sources.

High Environmental Pollution

Atmospheric Air. Cases of high atmospheric pollution (HP) (exceeding the MAC_{mot} by a factor of 10 or more) by substances in the second hazard class were registered 14 times in 7 cities: with nitrogen dioxide—12 MAC at Barnaul, up to 13 MAC at Dzerzhinsk in Moscow Oblast (6 cases), up to 21 MAC in Moscow (2 cases), 13 MAC in Novosibirsk and 20 MAC in Omsk; with phenol—up to 11 MAC at Lipetsk (2 cases); with chloroform—12 MAC at Salavat (in October 1993—22 cases in 7 cities). At Omsk there also were two cases of high pollution with acetaldehyde (up to 12 MAC) and one case of high pollution with ethyl benzene (18 MAC), at Norilsk—one case of high pollution with sulfur dioxide (11 MAC), at Magadan, Pervouralsk and Chermkhovo—one case each of high dust pollution (20 MAC, 11 MAC and 12 MAC respectively), at Barnaul—two cases of high dust pollution (up to 18 MAC, at Samara—two cases of high pollution with xylene (up to 20 MAC), at Tolyatti—one case each of high pollution with ethyl benzene and xylene (29 MAC and 11 MAC respectively). During October the presence of pollutants in concentrations 10 MAC or more was registered in 27 cases in 13 cities (in October 1993—in 10 cities in 35 cases).

Water Bodies. During October 1994 there were 162 cases of high pollution (HP) in 68 water bodies (in October 1993—89 cases in 55 water bodies).

The greatest pollution was registered in the basins of large rivers:—Volga and its tributaries the Kama and Oka (more than 25 percent of all cases of HP) in the territory of Astrakhan Oblast—with petroleum products (up to 39 MAC) and zinc ions (14-18 MAC), Samara Oblast—with mercury ions (up to 10 MAC), Perm and Sverdlovsk Oblasts—with copper ions (30-60 MAC), Tambov, Tula, Moscow and Ryazan Oblasts—with nitrite nitrogen (10-54 MAC);—Amur (more than 16 percent of all cases of HP) in the territory of Amur Oblast and Khabarovsk Kray—with zinc and copper ions (10-54 MAC);—Ob and its tributaries the Irtysh and Tobol (about 14 percent of all cases of HP) in the

territory of Altay Kray, Omsk and Tyumen Oblasts—with phenols (30-68 MAC) and with pesticides (16-32 MAC); Sverdlovsk Oblast—with copper ions (30-80 MAC).

Moscow City. In October the mean monthly benzene concentration in the urban atmosphere was 2.7 MAC, nitrogen dioxide—2.5 MAC, ammonia—2 MAC, formaldehyde—1.7 MAC, carbon monoxide and dust—1.3 MAC.

The maximum one-time concentrations on individual days of the month attained: nitrogen dioxide—20.7 MAC on Balchuga, 3.4 MAC on the Warsaw Highway, 2.9 MAC in Sukharev Square; ammonia—4.8 MAC on Brateyevskaya Street; carbon monoxide—4.2 MAC in Narodnoye Opolcheniye Street; dust—1.4 MAC in the neighborhood of the Ryazan Highway.

Lake Baykal. As before, the sewage of the Baykal Cellulose and Paper Combine was dumped into Lake Baykal in violation of the norms for its content of pollutants: violations for chlorides were detected in 56 percent of the samples analyzed in October, for phenols—in 35 percent of the samples, for suspended matter and coloration—in 20 percent of the samples, for poorly oxidizable organic substances (COD)—in 10 percent of the samples, for coloration—in 7 percent of the cases, for sulforganic substances—in 3 percent of the samples.

Radiation Conditions

During October 1994 radiation conditions were stable in the territory of the Russian Federation. The concentrations of radioactive substances in atmospheric air, the densities of their fallout and the dose intensities of gamma radiation in the terrain in the territory of the Russian Federation beyond the limits of the contamination zones caused by the Chernobyl catastrophe and other radiation accidents fell within the range of natural background variations.

In the most contaminated Zlynkovskiy and Krasnoyarskiy Rayons of Bryansk Oblast in populated places with a density of terrain contamination by cesium-137 greater than 40 Ci/km² the levels of the intensity of the gamma radiation exposure dose in the terrain (TED) fell in the range from 60 µR/hour (populated place Yalovka, Krasnoyarskiy Rayon) to 390 µR/hour (populated place Zaborye, Krasnogorskiy Rayon).

In the territories of Gordeyevskiy, Zlynkovskiy, Klintsovski and Novozybkovski Rayons of Bryansk Oblast in populated places with a density of terrain contamination by cesium-137 15-40 Ci/km² the TED values fell in the range from 55 (populated point Karchi, Novozybkovski Rayon) to 270 µR/hour (populated place Kozhany, Gordeyevskiy Rayon).

In the territories of 18 rayons in Bryansk, Kaluga, Orlovo and Tula Oblasts with a density of surface contamination by cesium-137 of 5-15 Ci/km² the levels,

according to the results of measurements made by expeditionary surveys, fell in the range from 22 (populated place Belousovo in Bryansk Oblast) to 70 $\mu\text{R}/\text{hour}$ (populated place Klubnichnyy in Bryansk Oblast).

In the territories of 16 oblasts in the Russian Federation (Belgorod, Bryansk, Voronezh, Kaluga, Kursk, Leninograd, Lipetsk, Nizhegorod, Orlovo, Penza, Ryazan, Saratov, Smolensk, Tambov, Tula, Ulyanovo), as well as in the Mordovian and Tatarstan Republics, with a density of surface contamination of the terrain by cesium-137 1-5 Ci/km^2 , the TED values, according to the results of regular measurements at stationary points, fell in the range from 11 to 28 $\mu\text{R}/\text{hour}$.

In comparison with the preceding month there were no appreciable changes in radiation conditions in regions where nuclear power plants and other radiationally dangerous facilities are located. The TED in the 100-km observation zones of nuclear power plants, the PO Mayak, the Krasnoyarsk Mining-Chemical Combine, the Siberian Chemical Combine and points for the burial of radioactive wastes fell in the range from 8 to 20 $\mu\text{R}/\text{hour}$, characteristic for the natural radiation background.

Footnote

1. This is an official Rosgidromet report.

Changes in Global Thermal Regime and Variability of Grain Yields

957A0324A St. Petersburg IZVESTIYA RUSSKOGO GEOGRAFICHESKOGO OBSHCHESTVA in Russian No 5, Sep-Oct 94 (manuscript received 11 Jan 94) pp 11-20

[Article by M. V. Nikolayev; UDC 910.1:631.559:633.1+583:632.11]

[FBIS Translated Text] Due to changes in modern climate the influence of the global thermal regime on the variability of yields during a prolonged time interval taking in the last century is of special interest. Such an influence is traced most conveniently in plantings of grain crops concentrated in the temperate latitudes where the anticipated climate changes will be extremely significant.

As is emphasized by researchers, in an analysis of the properties of the global climate system the greatest importance is assigned to the averaged thermal characteristics. This is attributable to the fact that globally averaged surface temperature is usually regarded as the principal variable describing modern climate changes.

The essence of the problem of climate changes and its different aspects were examined in the studies of M. I. Budyko [4-7]. Some aspects of the problem relating to the factors and mechanisms resulting in an increase in climate changes in the future also were examined in monographs [2, 9, 21] and other publications of an international character [29, 31].

An empirical analysis of year-to-year deviations (anomalies) of averaged air temperature gives evidence that their secular variation is determined by natural variations of solar radiation and an increase in the concentration of atmospheric greenhouse gases. The operation of the latter factor, as is well known, results in a trend to surface temperature increase [2, 5, 21].

This trend is traced in time series of mean temperature anomalies for the different hemispheres, individual latitude zones and different seasons of the year and in general in changes in the averaged global surface temperature.

It is necessary to state more precisely that the manifestation of the impact of changes in the global thermal regime on plant growth occurs through changes in heat supply conditions and what is particularly important, atmospheric moistening over extensive territories. For this reason the problem of the influence of the thermal regime on the moistening of agricultural zones has a quite prolonged prehistory and is examined quite fully in publications in our country.

For example, already in 1925 V. Yu. Vize drew attention to the fact that the nature of moistening by years in the grain-producing provinces of European Russia corresponds to changes in the circulation processes determining thermal conditions in the Arctic basin and thereby the ice content in northern seas. For this purpose he compared the course of April-May precipitation in the Volga region and the chernozem zone with ice conditions in the Barents Sea during the period 1896-1916 and then from 1917 through 1924. As a result of such a comparison it was noted that on the whole the aridity of the onset of the century and especially 1920, 1921 and 1924 was consistent with the extremely small quantity of ice in the western sector of the Arctic [8]. Considerably later a similar analysis, made by N. I. Zverev, indicated that the droughts of 1972 and 1975 also were preceded by a small ice content in the Baltic and Barents Seas; on the other hand, in years with severe ice conditions strong deficits of spring-summer precipitation were not observed in the European USSR [16]. The mentioned authors give regression equations making it possible, for a definite time in advance, to predict weather anomalies exerting an influence on the size of the harvest of agricultural products.

A somewhat different method for predicting precipitation during the growing season, with allowance for temperature variations, was proposed in the 1950's by D. A. Drogaytsev [12]. At its basis is a synoptic-statistical analysis of the fields of heat and cold indices during prewinter periods corresponding to rainy and dry years.

It was shown that prewinters with an anticyclonic heat transport system are usually followed by an arid spring and summer in the European (Ukraine) and Asiatic (Western Siberia, Kazakhstan) parts of the grain wedge

of the country. Later the principles of the synoptic-statistical approach were used extensively by V. M. Pasov in an analysis of variations in the yield of the principal grain crops [20].

The range of publications of recent decades also can be broadened by the studies of other authors. For example, V. G. Semenov studied the influence of the Atlantic on the temperature and precipitation regime in the European USSR [25]. V. N. Adamenko pointed out the peculiarities of pressure-circulation conditions developing over the grain-producing zone [1]. M. Kh. Baydal and A. I. Neushkin made a prediction of drought and crop yields in different regions of the USSR with allowance for the impact of macrocirculation factors [3].

Due attention also is devoted to this matter in the publications of O. A. Drozdov. For example, he gave a model of the regional change in the quantity of precipitation during the cold and warm seasons of the year accompanying a change in air temperature in the Arctic basin up to 5°C [13]. According to this model in the grain-producing zones of our country, North America and Europe it is possible to anticipate appreciable changes in the sums of falling precipitation, which may be the reason for the increased frequency of poor yields of grains in definite regions. In later studies [14, 15] he mentioned the indeterminate nature of the relationships arising between changes in the thermal regime and moistening for different levels in the development of warming. Attention was directed to the fact that in contrast to modern conditions, during considerable warmings moistening may increase substantially and this should be reflected favorably in grain production in regions of dry land cultivation (steppe, dry steppe and similar natural landscape categories).

In proceeding to a comparison of changes in the characteristics of the global thermal regime and the yield indices we will concentrate attention on the regions of grain production in the northern hemisphere, including the grain-producing zone of our country. However, we note that the use of the term "global thermal regime" also is applicable to the surface temperature indices averaged for northern hemisphere latitudes because it is precisely there that the world network of meteorological stations conducting prolonged observations is concentrated. Moreover, changes in the global climate system in many respects are determined by their changes in the northern hemisphere, where production and population of the planet are concentrated [7, 9].

In addition to surface temperature deviations, for further comparisons it also is of interest to examine the characteristics of the secular variation of anomalies in the mean meridional temperature gradient $\gamma = -\delta T / \delta \phi$. In particular, it was demonstrated in [5, 15] that with an increase in mean air temperature and a decrease in the meridional temperature gradients a trend appears to a decrease in the quantity of precipitation in regions of

unstable moistening, which in the last analysis results in the formation and development of arid conditions causing poor yields.

We will use the following time series for assessing the influence of thermal regime characteristics on yield variability:

- deviations of the mean annual global temperature of the atmospheric surface layer in the latitude zone 0-90° N, 0-60° S;
- deviations of the mean annual surface temperature in the extraequatorial part of the northern hemisphere (17.5-87.5° N);
- deviations in the mean monthly May and June air temperature in the northern hemisphere (0-90° N) [32];
- anomalies of the mean meridional surface temperature gradient during spring and summer in the latitude zone 25-75° N;
- deviations in world wheat yields from 1901 through 1989;
- deviations in spring wheat yields in the northern hemisphere temperate latitudes from 1910 through 1989;
- deviations in spring wheat yields in the European USSR from 1881 through 1980;
- deviations in wheat and corn yields in the United States from 1881 through 1989;
- deviations in wheat yields in Canada from 1908 through 1989;
- deviations in wheat yields in Great Britain from 1881 through 1989.

The series of actual yields were prepared on the basis of data from national and international sources and were finalized in the form of continuous time records [22-24, 26-28, 30].

The dynamics of the yield deviations (anomalies) ΔY was found by excluding the agrotechnical trends in the initial series. The yield trend was calculated by using analytic time functions (in those cases when the dynamics of agrotechnical factors was unknown). For corn and wheat in the United States the yield trend was computed on the basis of the dynamics of the doses of applied mineral fertilizers (up to 1920 the doses of annually applied lime fertilizers were regarded as the agrotechnical index) [17-19].

In order to compare the nature of the changes in surface temperature and yield variations on a global scale the anomalies of world wheat yields from [11] were correlated with deviations in the mean annual global temperature. The computed value of the paired correlation coefficient $r = 0.23$ indicates the statistical significance

of this assessment in the 99 percent confidence interval ($\alpha = 0.01$) for a stipulated length of the time samples. However, as might be expected, the absolute value of the correlation coefficient is low, which is attributable to the large set of terms entering into the considered characteristics. For example, the deviations of world wheat yields consist of the annual fluctuations of yields at different latitudes and moreover these fluctuations are considerably shifted in time and are highly dependent on the regional characteristics of crop growth.

Taking this into account, we will turn to an analysis of surface air temperature changes and yield fluctuations within the bounds of the northern hemisphere where most of the territories specializing in the production of commercial grain are located. A comparison of the course of deviations in the mean annual surface temperature in the extraequatorial latitudes of the hemisphere (ΔT) and the yield anomalies (ΔY) in the large grain-producing countries indicates the existence of a correlation between temperature fluctuations and the appearance of anomalies in yield dynamics. Usually sharp yield declines by years correspond to increases in mean annual surface temperature, whereas an increase in the harvest of grains corresponds to temperature decreases.

Still more indicative in this respect is a comparative analysis of yield variations by years and annual deviations in mean monthly temperature in May, and especially in June, that is, in those months of the year when there is vigorous development of grains in the temperate latitudes of the hemisphere. If, for example, the course of June temperature fluctuations, averaged for the hemisphere, is compared with anomalies of spring wheat yield in the European USSR for a hundred-year period it is possible to detect the following regularity: sharp yield declines in a whole series of cases correspond to the considerable temperature increments which are present in ΔT_{VI} time changes. Such a virtually complete correspondence was observed for the end of the last century; beginning of the following (current) century in the poor crop years 1885, 1889, 1891, 1906, 1911; then catastrophically poor crop yields occurred in 1920 and 1921. During the period of development of the trend to an increase in June temperature a considerable crop failure corresponded to the temperature peak in 1931; the poor crop of 1936 most likely corresponded to the crest of the temperature increase falling in the mid-1930's. During the subsequent decades (after a brief decrease in the 1960's) a further temperature increase, accompanied by sporadic appearance of its peaks, also caused a decrease in spring wheat yields in 1975 and 1977 and in the stressed situation of the 1980's.

Some poor crops, however, cannot be attributed to sharp fluctuations in the direction of an increase in the June temperature, averaged for the hemisphere, for example, in arid 1946. This is evidently attributable to the fact that the weather conditions of specific years are governed to a great extent by the characteristics of the circulation processes forming over the continents. Nevertheless, the poor harvests which occurred sometimes

can be traced with a small lag (usually one year) after the appearance of temperature fluctuations, such as in 1897, 1901, 1916, 1954 and 1984.

In many respects a similar pattern also is detected in a comparison of the nature of ΔT_{VI} fluctuations and variations in the yields of wheat and corn in the United States. For example, at the beginning of the secular variation, in 1885, 1888, 1896, 1900 and 1911, wheat yield decreases corresponded to well-expressed temperature fluctuations, and only in 1916 was there a lag in poor yields by one year. An increase in the temperature background in the 1930's was accompanied by a series of poor harvests beginning from 1933 and running through 1938. During 1949 wheat grain losses were observed after a temperature peak in 1948 (this is traced most clearly in May temperature changes). The poor yield of 1974 followed a sharp amplitude of the temperature variation in 1973; a decline in yields in 1988 occurred during a period of temperature increase in the course of the 1980's after the peak of 1987.

Similarly the appearance of poor corn yields is quite frequently accompanied by fluctuations in temperature in the direction of its increase during the preceding years—for example, in 1886, 1890, 1897 and 1913; poor crop yields also were grouped against high temperature backgrounds in the 1930's and 1980's. In 1980 and 1983 the appearance of poor yields fully coincided with positive June temperature peaks.

A period of decreases in spring wheat yields in Canada from 1918 through 1921 corresponded to a rise in June temperature during the mentioned years. The crop failure of 1931 fell at its maximum and a series of subsequent poor yields can be traced against a general background of a temperature increase. Sharp yield declines in 1954 and 1961 followed ΔT_{VI} fluctuations in 1953 and 1960. The poor yield of 1967 coincided with the strongest fluctuation in May temperature during the period from 1958 through 1972. During the course of the 1970's and 1980's considerable underharvests of spring wheat occurred in the same years as for crops cultivated in the United States.

Poor wheat yields in Great Britain, which are noted considerably less frequently than in grain production zones in the USSR, United States and Canada, also can be related to fluctuations in the global thermal regime. For example, such a relationship as a whole is traced for 1900, 1912, 1931, 1936-1937, 1947, 1960, 1968 and 1987, which corresponds to the appearance of well-expressed positive temperature anomalies. With respect to the marked poor harvest caused by the anomalously dry conditions of 1976, it was observed with a decrease in temperature averaged for the hemisphere. However, in the preceding year, 1975, the temperature was appreciably higher than in 1976.

A definite idea concerning the degree of correlation between yield variations and the course of deviations in

June temperature averaged for the hemisphere is provided by the correlation coefficient estimates given in the table.

Correlation between smoothed course of deviations in mean monthly June temperature (0-90° N) and smoothed anomalies of grain crop yields

Moving averaging interval (years)	Wheat (Great Britain)	Spring wheat (European USSR)	Wheat* (Canada)	Wheat (United States)	Corn for grain (United States)
3	-0.02	-0.18	-0.24**	-0.26**	-0.32**
5	-0.01	-0.023**	-0.32**	-0.35**	-0.46**
7	-0.10	-0.30**	-0.39**	-0.45**	-0.53**
9	-0.21**	-0.37**	-0.47**	-0.54**	-0.58**

* Spring forms of the steppe ecotype dominate in Canada.

** Correlation coefficient statistically significant at the level $\alpha = 0.01$.

By comparing these evaluations it can be determined that the sensitivity of yield variations to temperature changes is greater for those territories within whose boundaries the sown crops are concentrated in less moistened intracontinental regions. Under conditions of a moist climate (for example, in Great Britain) there is virtually no correlation between the $+\Delta T$ and $-\Delta Y$ fluctuations.

It must be noted that the values of the correlation coefficients are highest for crops growing in the United States, and especially corn. In part this can be attributed to the fact that computations of yield trends in the United States are made with allowance for the dynamics of an agrotechnical index—the quantities of annually applied mineral fertilizers. The latter procedure, as indicated in [17], makes it possible to determine more precisely the variations of yields by years, at the same time reducing the residual dispersion of the initial series. On the other hand, it can be postulated that quite likely the thermal fluctuations exerting an influence on the moistening conditions of individual years exert a greater influence in the submoist zone where sowings of high-yield crops, sensitive to sharp changes in the agroclimatic regime, predominate.

As an illustration of what has been said, Figure 1 [not reproduced here] shows the secular dynamics of fluctuations of mean June temperature (0-90° N), as well as its smoothed variation, comparable to the smoothed variation of corn yield deviations ΔY (tons/hectare) in the United States. The figure shows that there is a negative correlation between the ΔT_{VI} and ΔT changes, smoothed for a nine-year period; this is traced in all parts of the time samples. On the upper curve it also is possible to trace the presence of an increasing trend in the June temperature change caused by the factors already mentioned earlier. The lower curve is characterized by an increase in the amplitudes of the ΔY deviations with time, which is attributable to improvement in the selection of varieties, resulting in an increase in corn productivity. It must be noted that an asynchronous variation of the smoothed temperature and yield anomalies is not just traced for the June temperature. Such a regularity

persists in those cases when as the climatic variable we take the temperature in May, other months or the year as a whole, averaged by hemispheres. In definite cases such a choice will be entirely justified, especially for winter crops characterized by a more prolonged growing season.

With respect to yield decreases associated with increases in averaged temperature, it is impossible not to note the different nature of the course of thermal fluctuations observed in individual time intervals. It has been established that at the end of the 19th century, and especially in the 1930's of this century, prolonged temperature rises were caused by natural climatic factors—an increase in atmospheric transparency during periods of weakening of volcanic activity. During these periods definite latitudinal temperature distributions developed, which in turn exerted an influence on the nature of moistening and was manifested in an intensification of aridity in continental regions. Since the mid-1960's the temperature increase trend has been related to the anthropogenic impact on climate. This is expressed in the characteristics of the distribution of the temperature and precipitation fields, which in the last analysis are reflected in the harvests of wheat, corn, barley and other crops.

A comparison of the year-to-year yield variations and the secular variation of the mean meridional surface temperature gradient also reveals a correlation in the changes of the mentioned characteristics. A comparative analysis of the course of γ anomalies during spring and summer in the latitude zone 25-75° N and the course of yield deviations in the temperate latitudes of the hemisphere makes it possible to detect the following characteristic behavior of their dynamics. It is essentially as follows: a greater frequency of yield declines corresponds to decreases in γ values ($\gamma < 0$) falling during warming periods. A regularity of this type is perceived quite clearly both in a comparison of the initial γ and ΔY time series and in the series of their smoothed indices. For example, if an analysis is made of the variability of spring wheat yields by years in the European USSR and in Canada it can be confirmed that on the whole the ΔY variations correspond to the course of anomalies of the meridional temperature gradient, particularly during

summer. In both cases the correlation is already significant in the 99-percent confidence interval for the initial time records, increases with an increase in the smoothing interval and attains the 0.5 level with 10-year moving averaging.

For wheat cultivated in the United States the correlation between the smoothed yield deviations ΔY and γ is somewhat lower ($r = 0.4$), which is evidently attributable to the predominance of winter crop forms, more drought resistant. In the corn yield variations a greater sensitivity is manifested to a γ change during spring than during summer. For Great Britain the correlation coefficients between ΔY and γ are low and significant only with high-order smoothing.

Since spring crop forms are most susceptible to the changes in the climatic conditions of their growth, it is of interest to trace the sensitivity of variation of yields of spring wheat, like crops as a whole, to change in the middle-latitude γ variation. The annual absolute deviations in the yields of spring wheat (tons/hectare) in the latitude zone 45-55° N during the period from 1910 through 1989 were calculated for these purposes. In obtaining the ΔY dynamics, represented in Figure 2,b, use was made of annual data on sown areas and gross harvests of spring wheat in the USSR, United States and Canada, whose share is approximately 85 percent of its total harvest in the temperate zone of the northern hemisphere.

For further comparisons we will turn to the curves in Figure 2 [not reproduced here] showing the 5-year smoothed γ variation during spring and the deviations in spring wheat yields compared with them. By analyzing the curves it is possible to note a definite consistency in the nature of change of the selected indices. It can be seen, in particular, that periods with an increase in the meridional temperature gradient correspond to phases of crop yield increase, whereas with a decrease there are reduced yields. It is characteristic that decreases in spring wheat yield occurred in the 1930's, late 1940's, and also in the mid-1970's, that is, during that time interval when there were well-expressed decreases in the interlatitude temperature contrast in the temperate latitudes, which, in turn, caused a lessening in the transport of oceanic moisture into the heart of the continent.

It also is interesting to compare the course of crop yield anomalies with the course of anomalies of the meridional temperature gradient during winter, that is, during the period preceding the growing season. (We note that in [7, 9] there is mention of the greatest sensitivity to ΔT changes during winter in comparison with other seasons of the year accompanying the observed air temperature changes in the northern hemisphere).

This comparison made it possible to confirm that there is a definite correlation in the changes of the considered indices; the observed γ increase, somewhat displaced toward the end of the 1960's, agrees more closely with the subsequent crop yield increase. However, similar to

the data in Figure 2, there is some lag in the course of the anomalies of the yields of spring wheat relative to the course of the anomalies of the meridional temperature gradient during winter.

Since the secular variation of the mean meridional temperature gradient exerts a considerable influence on the atmospheric moistening regime, it also is feasible to compare the yield variability with multiyear data on the quantity of precipitation falling over extensive grain-producing territories. Such data, for example those cited in [10], indicate the appearance of general trends in the formation of aridity within the bounds of major agricultural zones—the USSR and the United States—beginning at the end of the last century. Our computations confirmed the presence of a correlation between changes in the mean quantity of precipitation falling over the mentioned zones and grain yield variations.

In completing this brief exposition of the question of the influence of changes in the global thermal regime on yield stability it must be emphasized that the results and conclusions may be useful in broadening concepts concerning the nature of the impact of climate changes on the productivity of cultivated plant associations. Without question the acquisition of new and more detailed data on changes in the global thermal regime in the future will make it possible to answer a number of other important questions relating to assessments of possible future yield variations.

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Formation of M-Like Intermediate in Photocycle of 13-Cis-Analogs of Bacteriorhodopsin

957COO29A Moscow BIOKHIMIYA in Russian
(manuscript received 13 Nov 92, final draft 25 Jan 93)
Vol 58 No 6 Jun 93 pp 819-826

[Article by L.A. Dradchev, A.D. Kaulen, L.V. Khitrina, et al., Scientific Research Institute of Physico-chemical Biology imeni A.N. Belozerskiy; Moscow Institute of Precision Chemical Technology; Institute of Cell Biophysics, Russian Academy of Sciences; Pushchino, Moscow Oblast] UDC 577.355

[FBIS Abstract] A study of the effect of pH on photocycles of 13-cis-isomers of fluorophenyl bacteriorhodopsin and 11, 12-didehydrobacteriorhodopsin was described. The presence of type M intermediate in photocycles of pigments with 13-cis-isomer of chromophore at high pH values was shown directly with the use of fluorophenyl bacteriorhodopsin and 11, 12-didehydrobacteriorhodopsin, bacteriorhodopsin analogs with significantly retarded dark adaptation. Successful combination of properties in 11, 12-didehydrobacteriorhodopsin indicated that amplitudes of M-determinants in photocycles of all-trans-isomer at pH 6 and of its cis-isomer at pH 6 and of its cis-isomer at pH 9.1-9.8 are quite similar. Figures 4; references 42: 14 Russian, 28 Western.

Affine Modification of Proteins, Binding Nucleic Acids in Cells of Mammals, Acclimated by Derivatives of Oligonucleotides

957COO29B Moscow BIOKHIMIYA in Russian
(manuscript received 7 Jul 92) Vol 58 No 6
Jun 93 pp 962-965

[Article by V.V. Vlasov, Ye.M. Ivanova, M.V. Nechayeva, et al.; Novosibirsk Institute of Bioorganics Chemistry, Russian Academy of Sciences; Siberian Department] UDC 577.123

[FBIS Abstract] The specificity of interaction of oligonucleotides with mammalian cells was studied with ³²P-labelled alkylating oligonucleotide derivative (pT)16. In most of the cell lines of fibroblastoid origin studied (COS-1, vero, L-671, Ag 17-1, CHO, B7) and in mouse hepatocytes appeared proteins, specifically interacting with oligonucleotides. Ag17-1 and COS-1 cells contained a protein with molecular mass of 85kDa in addition to a protein with a molecular mass of 79kDa, typical of all fibroblast lines studied in this work. Protein in BALB/c mouse hepatocytes, 83kDa protein is the main oligonucleotide-binding protein. The value of constants of binding of oligonucleotide derivatives with protein was determined on the base of concentration dependences of specific modification of protein receptors for hepatocytes. This value equalled 5 times 10⁶M⁻¹ for alkylating derivative of oligonucleotide pT(16)0 and the corresponding phosphothioate oligonucleotides. Figures 3; references 8: 3 Russian; 5 Western.

Optical Properties and Structure of Langmuir-Blodgett Films of Complexes of Nucleic Acids With Lipids and Synthetic Amphiphilic Molecules I Infra-Red Spectra, Structure and Hydration of Multilayer Langmuir Film of Complex of Polyuridylic Acid and Octadecylamine

957COO58A Moscow BIOFIZIKA in Russian
(manuscript received 22 Jun 93) Vol 39 No 2
Mar-Apr 94 pp 302-311

[Article by B.I. Sukhorukov, M.M. Montrel; G.B. Sukhorukov and L.I. Shabarchina; Institute of Theoretical and Experimental Biophysics; Russian Academy of Sciences; Pushchino (Moscow Oblast); Department of Physics, Moscow State University imeni M.V. Lomonosov]

[FBIS Abstract] Production and analysis of IR-spectra of undeuterated and deuterated poly(U) films, multilayer Langmuir-Blodgett films of poly(U)-octadecylamine in solid state and non-polar solvents showed that complexing poly(U) with aliphatic amine, on the surface of an aqueous or water-salt phase does not produce molecular ionic conversion of poly(U) and the nucleic base in the complex is in molecular form. A method of determining stoichiometry of the complex was developed and stoichiometry of the multilayer Langmuir-Blodgett film being studied was assessed. During complexing bands typical of ammonium +NH₃-groups appear instead of bands of the valent and deformation vibrations of the amino group of octadecylamine. The two main parts of the model of the complex are the hydrophilic channel made up of +NH₃-groups of aliphatic amines and some fragments of the polynucleotide chain and a hydrophobic aliphatic bilayer insensitive to water content. Figures 5; reference 29: 12 Russian, 17 Western.

Effect of Cholesterol and Dicytolphosphate on Physical Parameters of Liposomes

957COO58B Moscow BIOFIZIKA in Russian
(manuscript received 28 Jul 93) Vol 39 No 2
Mar-Apr 94 pp 323-327

[Article by O.P. Bondar, P.A. Voziyan, S.D. Danchuk, et al.; Institute of Biochemistry imeni A.V. Palladin; Ukrainian Academy of Sciences; Kiev]

[FBIS Abstract] A study of physical parameters of liposomes from phosphatidylcholine with cholesterol and phosphatidylcholine with dicytolphosphate included determination of the sizes, electrophoretic mobility and surface density of the liposomes studied. Dicytolphosphate, like cholesterol, increased the thickness of the bilayer of the phosphatidylcholine liposomes but the area occupied by one lipid molecule was unchanged by dicytolphosphate in contrast to cholesterol. The indication that the composition of lipids, used as model systems, have different effects on their physical parameters. These effects often are disregarded in interpretation of experimental data. Figure 1; references 9: 8 Russian, 1 Western.

Effectiveness of Energy Conversion in Process of Active Transport of Ions in Biomembrane

957COO58C Moscow BIOFIZIKA in Russian
(manuscript received 21 Sep 92) Vol 39 No 2
Mar-Apr 94 pp 337-344

[Article by A.V. Melkikh and V.D. Seleznev, Uralsk Polytechnical Institute, Ekaterinburg]

[FBIS Abstract] Simple statistical models of active ion transport in a biomembrane, which provided expressions for the coefficient of energy conversions for linear and nonlinear processes, were presented and discussed. In the linear case, the coefficient equalled that obtained in linear thermodynamics. Transport parameters of ions were found on the basis of the maximum of this coefficient. Results of the statistical model agreed closely with experiments on active transport of ion in biomembranes. References 3: 2 Russian, 1 Western.

Effect of Weak Electrical Effect on Trigger System of Transmembrane Ionic Transfer

957COO58D Moscow BIOFIZIKA in Russian
(manuscript received 9 Apr 93) Vol 39 No 2
Mar-Apr 94 pp 345-350

[Article by T.F. Plyusnina, G.Yu. Riznichenko, S.I. Aksenov and G.M. Chernyakov; Biological Department; Moscow State University imeni M.V. Lomonosov; Military-medical Academy S.M. Kirov; Saint Petersburg]

[FBIS Abstract] A study of a mathematical model of a system of transmembrane ionic transport with two steady states showed that a low-frequency variable electric field can cause transitions from one state to the other or can initiate oscillations between them, leading to a corresponding threshold change or oscillations of pH and ion concentrations near the membrane. Figures 5; references 9: 8 Russian; 1 Western.

Modeling Recognition of Images in Real Neuronal Structures

957COO58E Moscow BIOFIZIKA in Russian
(manuscript received 22 Sep 92) Vol 39 No 2
Mar-Apr 94 pp 385-389

[Article by A.A. Yudashkin; Samara Polytechnical Institute]

[FBIS Abstract] Construction of a neuronal network imitating recognition of images in nature, was based on

synergetic principles of competition of images in the recognition process, in which only the image most closely resembling the image presented survives. The network uses only a small amount of information compared to that required for existing algorithms. A method of brightness segmentation, which permits transformation of the initial picture into one less clear, was used in the process. Clarity segmentation proved to be a good instrument for modelling recognition of images, since it permits imitation of perception of objects by man. Use of a minimal amount of information and only general characteristics of the surface of the object examined for recognition made it possible to construct, on the basis of it, effective neuronal network systems, requiring little information. Figures 4; references 8: 3 Russian, 5 Western.

Children's Health in an Endemic Goiter Area

95740020A Moscow VRACH in Russian No 7,
Jul 94 pp 16-17

[Article by L. Sheplyagina, doctor of medical sciences, Moscow Medical Academy imeni I. M. Sechenov; L. Lisenkova, candidate of medical sciences, N. Bolotova, T. Glukhova, candidate of medical sciences, and N. Kurmacheva, Saratov Medical Institute: "Children's Health in an Endemic Goiter Area"]

[FBIS Translated Text] A considerable number of publications recently dealt with the problem of endemic goiter (EG). However, no epidemiologic studies were made that would permit a comprehensive assessment of the health of children living in areas with a chronic biospheric iodine deficiency.

We investigated the incidence of EG and somatic pathology in 1520 children, aged 0 to 14, in an endemic goiter area—the Khvalynskiy Raion of the Saratov Oblast. Our study followed a conventional methodology. To estimate the gravity of EG, we made use not only of clinical and functional criteria (palpation and ultrasound investigation (USI) of the thyroid), but also of chemical criteria (the iodine urine excretion level).

The group of EG children included all patients who exhibited, at palpation and/or USI, a modification of the thyroid in the form of a diffuse enlargement or a nodal formation. The size of the goiter was measured according to the classification of O. Nikolayev (1966).

The prevalence of EG in children averaged 494.7 ppt, with certain age variations (Table 1).

EG Prevalence (in %) in Children as a Function of Age and Sex

Sex of Those Researched	Age				Average
	0-4	5-6	7-9	10-14	
Boys	126.9	396.7	672.3	814.8	473.9
Girls	171.3	432.0	689.3	813.6	514.9

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The thyroid pathology structure displayed a predominance of the increase of the thyroid gland of degree II (61.6 percent); and enlargement of degree I was recorded in 33.6 percent of the subjects, degrees III-IV in 4.3 percent, and nodal formations in 0.5 percent.

We conducted USI in 119 of 1,520 children. We observed that, in 83 children, thyroid was increased compared with the age norm: in 43, under 50 percent; in 35, by 50-100 percent; and in 5, it was enlarged by 150 percent or more. In the remaining children the thyroid was normal or slightly smaller than the normal.

Urinary excretion of iodine was recorded in 213 patients. The median of iodine excretion was 5.1 μ g percent. A distinct reduction of iodine excretion was observed in 30.1 percent, a moderate reduction in 19.7 percent, and a slight reduction in 31.9 percent of the

children investigated. Thus, we discovered an iodine deficiency in 81.7 percent of the children.

An analysis of the disease incidence based on physical work-up data identified a high level of occurrence of chronic pathology in all those investigated: 1662.7 percentage points (ppt). The highest level of the disease was observed among children aged 7 to 9 (2310.4 ppt) and from 10 to 14 (2181.1 ppt). The primary forms of the disease were dysfunctions of the endocrine system (534.2 ppt), as well as digestive dysfunctions and disruptions of metabolism and immunities. Common occurrences were also respiratory diseases (354.6 ppt) and diseases of digestion (274.4 ppt) and the bone-muscular system and conjunctive tissue (126.3 ppt).

In an analysis of the disease prevalence as a function of EG in children (Table 2), we found that chronic diseases had a higher occurrence in correlation with EG.

Prevalence of Chronic Disease (ppt) in Children With and Without EG

Disease	Children's Group	
	With EG (n = 752)	Without EG (n = 768)
Circulatory system	2.6	1.3
Respiratory organs:	476.3	238.3
Pharyngitis	191.3	49.5
Tonsil and adenoid disease	242.7	158.9
Allergic rhinitis	11.9	5.2
Gastrointestinal organs:	328.5	224.0
Caries	248.0	170.6
Gastritis, duodenitis	36.9	14.3
Dyskinesia of biliary tracks	31.7	14.3
Bone-muscular system and conjunctive tissue	190.0	63.8
Scoliosis	81.8	22.1
Autonomic vascular dystonia	26.4	9.1
Mental retardation	9.2	5.2

It is likely, therefore, that, with a chronic iodine deficiency, the enlarged thyroid is not always capable of producing enough hormones for a normal functioning of the child's body. Apparently, even a minor deficiency of thyroid hormones that cannot be detected clinically can have a negative effect on the health status.

Reaction of Catalytically Active Antibodies With Oligonucleotides

957A0061A Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94 (manuscript received 9 Nov 93) pp 738-743

Article by V.N. Buneva, O.A. Andriyevskaya, I.V. Romannikova, G.V. Gololobov, R.P. Yadov, V.I. Yamkovoy, and G.A. Nevinskiy, Novosibirsk Institute of Bioorganic Chemistry, Sibirsk Otdeleniye, Russian Academy of Sciences; Novosibirsk State University

(second and sixth authors); Institute of Molecular Biology imeni V.A. Engelgard, Russian Academy of Sciences, Moscow (fourth and fifth authors).

[FBIS Abstract] The interaction of antibodies from the blood sera of patients with the autoimmune disease systemic lupus erythematosus with oligoribonucleotides was studied. Gel-electrophoresis data indicated that catalytically active antibodies hydrolyze both desoxy- and riboadenylate, especially the latter. A study of the interaction of cCMP and poly(U) with antibodies showed that the rates of hydrolysis of cCMP and poly(U) comprise 10 and 20-40 percent of the rates of their hydrolysis with RNAase A, respectively.

It was necessary to show that the RNA catalyzing activity is due to the intrinsic properties of the antibodies and not due to an impurity possessing enzyme activity. An increase in the amount of Protein G-Sepharose added to

the reaction mixture with the antibodies leads to a decrease in the RNA-hydrolyzing activity of catalytically active antibodies. The RNA-hydrolyzing activity is sorbed on Protein G-Sepharose at neutral pH's and is elutriated at acid pH's. The chromatographic patterns of the protein and RNA-hydrolyzing activity coincide. Therefore, the capability to hydrolyze RNA is a specific property of the antibodies. Another proof is that homogeneous preparations of the F(ab)₂ fragment of the IgG fraction of the antibodies also hydrolyze RNA practically as efficiently as the original antibodies.

In a study the substrate specificity of catalytically active antibodies, it was found that the optimum pH of RNA hydrolyzing activity is 8.7.

For the first time it has been shown that the autoantibodies of the blood serum of erythematosus possess not only DNA but also RNA hydrolyzing activity. Figures: 5; Table: 1; References: Russian 6, Western 6.

Functional Analysis of the 5'-Flanking Region of Gene 6b From TL-DNA pTiBo542 in Transgenic Tobacco Plants

957A0061B Moscow MOLEKULARNAYA BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94 (manuscript received 9 Nov 93) pp 744-751

[Article by I.L. Bagyin, Ye. V. Rebenkova, A.S. Krayev, and K.G. Skryabin, Bioengineering Center, Russian Academy of Sciences, Moscow]

[FBIS Abstract] Fragment Ti of the plasmid of *Agrobacterium tumefaciens*—T-DNA—is transported by agrobacterial infection into plant cells and is integrated into the nuclear genome. This leads to the formation of crown gall tumors. Transgenic tobacco plants *Nicotiana tabacum* carrying the reporter gene coding for β -glucuronidase (GUS) under the control of an 826 bp (from the start of translation) fragment of the 5'-flanking region of the gene 6b from TL-DNA of pTiBo542 were studied. Gene 6b is a special type of gene which modifies cell growth and participates in regulating phytohormone activity. It is believed that the distribution of promoter activity (6b-GUS plants had a 20-80 fold higher activity in roots than in leaves) is explained by the fact that the gene*pt* must be expressed immediately after transport of T-DNA, and these parts of the plant are the more probable place of infection by agrobacteria under natural conditions.

The activity of the 5'-flanking region of gene 6b is stimulated by wounding and by the addition of phytohormones. Figures 4; references: 3 Russian, 41 Western.

Effect of the 5'-Leader of the Potato Virus X on the Expression of the Coat Protein of the Potato Virus Y in Transgenic *Solanum tuberosum* Plants

957A0061C Moscow MOLEKULARNAYA BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94 (manuscript received 12 Nov 93) pp 752-760

[Article by M.M. Pugin, M.A. Sokolova, O.A. Shulga, and K.G. Skryabin, Bioengineering Center, Russian Academy of Sciences, Moscow]

[FBIS Abstract] The 5'-leader of potato virus X (PVX) genomic RNA was used successfully to generate potato plants expressing the coat protein of the potato virus Y^N (Russian isolate (PVY CP). Two expression cassettes were constructed that carried the PVY CP coding region of the gene of the coat of the potato Y-virus (BO Y-BK) with artificial initiation by the codon under the control of the 35S-promoter and the terminator of the cauliflower mosaic virus and differing in the sequence of the 5'-leader of the mRNA of BO Y-BK. In one cassette this is a 37-nucleotide polylinker, and in the other an 80-nucleotide 5'-leader, including a shortened variant of the 5'-leader of the genome RNA of the potato virus X.

Transgenic Belorussian-3 potato plants generated by agrobacterial transformation were shown to express the PVY CP gene to a different extent depending on the cassette integrated into the plant genome. Plants carrying the cassette with the polylinker leader produced no coat protein above the Western detection threshold, but the cassette containing the PVX leader provided detectable amounts of the coat protein. The PVX leader is believed to influence mRNA stability. Figures 4; references: 45 Western.

New Method of Nonradioactive Labeling of Oligonucleotides and Their Use as Allele-Specific Probes for Revealing Mutations Produced by β -Thalassemia

957A0061D Moscow MOLEKULARNAYA BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94 (manuscript received 9 Jul 93) pp 796-804

[Article by I.V. Lebedeva, M.G. Ivanovskaya, A.N. Fedorov, S.A. Limborskaya, and Z.A. Shabarova, Research Institute of Physicochemical Biology imeni A.N. Belozerskiy, Moscow State University imeni M.V. Lomonosov; Institute of Molecular Genetics, Russian Academy of Sciences, Moscow (third and fourth authors)]

[FBIS Abstract] Hybridization analytical methods were used to determine the genotype of a DNA sample of 1 ng of amplified material in a study of the IVS 1-110 mutation of the β -globin gene which causes β -thalassemia. The β -globin gene fragment was amplified by a polymerase chain reaction, and subsequently the amplified DNA was hybridized with allele-specific probes labeled with biotin or horseradish peroxidase (HRP). Biotinylated oligonucleotides were obtained in quantitative yields, and oligonucleotide conjugates with HRP were obtained in 60-80 percent yields. HRP-labeled probes were used in hybridization without preliminary separation after synthesis. The streptavidin-HRP conjugate was used to detect the biotinylated probe. Dianisidine was used as a chromogenic substrate. This approach is simpler and faster than previous analytical methods and can be recommended for the analysis of amplified samples of DNA obtained from the blood of patients homozygous in the mutant gene and also of patients who are heterozygous carriers. Figures 3; references: 6 Russian, 18 Western.

Efficiency of Conducting Sequencing by Means of Stacking Hybridization on Oligonucleotide Matrices With Various Lengths of Immobilized Oligonucleotides

957A0061E Moscow MOLEKULYARNAYA
BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94
(manuscript received 12 Oct 93) pp 832-839

[Article by Yu. P. Lysov, A.A. Chernyy, A.A. Balayev, F.N. Gnuchev, K.L. Beattie, and A.D. Mirzabekov, Institute of Molecular Biology imeni V.A. Engelgardt, Russian Academy of Sciences, Moscow; Center for Advanced Studies, Houston (fifth author)]

[FBIS Abstract] Sequencing by increasing the duplex by means of continuous stacking hybridization of oligonucleotides (l-oligonucleotides) added in solution to oligonucleotides (L-oligonucleotides) immobilized on a matrix was investigated. The efficiency of reconstruction of the sequenced fragments containing up to 30,000 nucleotides was analyzed. Combinations of L- and l-oligonucleotides were studied. The length of L-oligonucleotides varied from 6 ($M = 4096$) to 9 ($M = 262,144$) and the length of the added l-nucleotides varied from 3 ($m = 64$) to 6 ($m = 4096$). The results show the possibility of using different matrices. Continuous stacking makes possible a considerable increase in the length of sequenced DNA fragments. The method can be used for resolving ambiguities in branching points, which occur because of long repeats. It is based on the continuous stacking hybridization of several l-oligonucleotides which form a "chain" stabilized by mutual stacking interaction. Figures 4; references: 2 Russian, Western 12.

Rapid and Precise Method for Lattice Approximation of the Folds of a Protein Chain Based on an Algorithm of Dynamic Programming

957A0061F Moscow MOLEKULYARNAYA
BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94
(manuscript received 22 Nov 93) pp 855-864

[Article by N.A. Timchenko, V.V. Duniyakov, and A.N. Duniyakov, Petersburg Institute of Nuclear Physics imeni B.P. Konstantinov, Russian Academy of Sciences, Gatchin]

[FBIS Abstract] Network models of protein structures have been widely used in the computer study of the structure and self-organization of protein molecules. Ordinarily the sequential approximation method has been used to design the structure of the lattice approximation. Such a method corresponds to local and not global minimization of the error function. The dynamic programming method presented here shows that at a given lattice orientation relative to the protein, global minimization of the error function is possible.

For each monomeric unit, its eight possible positions on a cubic lattice were studied. Self-crossing was excluded

by means of the repulsion potential. Terms are introduced into the "energy function" which simulate the repulsion of the atoms close together in space.

A recursive algorithm is proposed for finding the minimum of the error function which may be solved by the standard dynamic programming method.

A computer experiment was conducted on 729 different orientations by turning the latter by 0, 10, 20, 30, 40, 50, 60, 70, 80° for each of three Eulerian angles. The absence of strict limitation on the length of the bond considerably facilitates the design of a lattice model. If the bonds of the lattice model can be either longer or shorter than the "standard" 3.8 Å, the design of a lattice model proves to be possible regardless of the size and architecture of the protein—practically for any of its orientations with respect to the lattice.

In the general case, the global method of minimization of the error function does not guarantee the design of a lattice structure without self-crossing. The greatest difficulty for the algorithm is presented by lattices with a long edge equal to the distance between two neighboring C_{α} -atoms, especially under conditions of strong fixation of the distance between the monomeric units. At the same time, on the average, the number of lattice models without self-crossing decreases with an increase in the chain length.

The difference between the values of the RMS (root-mean-square) obtained for different orientations of the lattice with regard to the protein is comparatively small for all models in which self-crossings are absent. The precision of the models does not change when the repulsion parameter γ changes from 0 to 2 and becomes somewhat worse when $\gamma = 0.8$. The maximal probability of obtaining a model without self-crossing of the chain is when $\gamma = 0.2$; obviously, this is the optimal value for modeling proteins.

The results of this algorithm are compared to those in the literature. Figures: 3; Tables: 3; References: Russian 1, Western 6.

Transcription of Antisense RNA of the Human C-MYC Gene

957A0061G Moscow MOLEKULYARNAYA
BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94
(manuscript received 16 Feb 94) pp 909-917

[Article by L.N. Shlyakhova, A.V. Itkes, B.K. Cernov, L.L. Kiselev, Institute of Molecular Biology imeni V.A. Engelgardt, Russian Academy of Sciences, Moscow]

[FBIS Abstract] The human expression gene *c-myc* plays an important role in proliferation and malignant transformation processes. The gene consists of three exons, the first of which is not translated. Antisense transcription of this gene is observed in HeLa, Burkitt lymphoma

BL-60 t(8;22) cells and diploid fibroblasts. By means of the primer extension technique, two starting points of antisense transcription were detected and mapped within the first (untranslated) exon of the *c-myc* gene. Computer analysis showed the similarity between the nucleotide sequence of the first *c-myc* isitron and the SV40 DNA fragment containing the binding sites for transcription factors GT-I, GT-II, TC-I, and TC-II.

The DNA fragment of the first *c-myc* isitron is able to form complexes with proteins in the HeLa cell extract. Three nucleotide sequences are involved in the reactions. The results imply that *c-myc* antisense transcripts may participate in the regulation of human *c-myc* gene expression.

Images of Protein Families for Comparison With Amino Acid Sequences

957A0061H Moscow MOLEKULARNAYA BIOLOGIYA in Russian Vol 28 No 4 Jul-Aug 94 (manuscript received 6 Sep 93) pp 932-939

[Article by A.G. Bachinskiy, V.A. Kulichkov, and A.A. Yarygin, Vektor Scientific Production Association, Ministry of Public Health, Russian Federation, Koltsovo, Novosibirsk, Oblast]

[FBIS Abstract] In principle the possible function of a random sequence can be determined in two steps by means of comparison with sequences which have known functions: first by the rapid methods of identifying local homology, a list of substances with "suspicious" isofunctioning is compiled; then the degree of similarity, the completeness of structural properties exhibited by the function, etc. are determined by more precise methods. The purpose of this study was to develop a method for carrying out the first function by using samples characterizing a given function on the basis of the analysis of the structure of families of proteins possessing this function and also to do a rapid comparison of the given sequence with samples of the functions. The advantage of a relatively direct comparison with each sequence of a bank should be achieved by decreasing the number of acts of comparison and by simplifying the algorithm, in particular, by the absence of the necessity to match the sequences.

The method is based on the physicochemical properties of amino acids and on the choice of fragments of amino acid sequences of protein families that maximally distinguish the sequences from member of other families or random sequences. Samples of families of α -hemoglobins, neurotoxins, α -interferons, and DNA-polymerase were compared with the SWISS-PROT bank. Figure 1; table 1; references: 15 Western.

Center for Pesticide Regulation: Concerns and Plans

957A0096A Moscow ZASHCHITA RASTENIY in Russian No 4 Apr 94 (signed to press 24 Mar 94) pp 3-5

[Interview with Liliya Vladimirovna Selivanova and Valeriy Nikolayevich Rakitskiy by T. N. Fomenko; first three paragraphs are ZASHCHITA RASTENIY introduction]

[FBIS Translated Text] We have already reported in the January issue of this journal that the Center for Regulation of Biologicals in Protvino, Moscow Oblast, succeeded VNIIGINTOKS [All-Union Research Institute of Hygiene and Toxicology] in matters of toxicological and hygienic evaluation of biologicals used to protect plants. Today, we are introducing a subdivision that heads work on toxicological evaluation of chemicals, the Center for Hygienic Regulation of Chemicals Used in Agriculture, established at the Research Institute of Hygiene and Occupational Diseases imeni F. F. Erisman (Moscow).

"It was not formed in a vacuum," we are told by ANATOLIY IVANOVICH POTAPOV, Academician of the Russian Academy of Natural Sciences and corresponding member of the Russian Academy of Medical Sciences. "It comprises laboratories of toxicology and hygienic standardization of our institute which have a solid foundation and experienced specialists. At present, there are 55 associates at the Center, clear-cut directions of work have already been established, and an operations schematic has been elaborated. Some tangible support has been received from the State Committee for Sanitary and Epidemiological Oversight. The Center is part of the common system of tests for registration purposes, and it has become the chief organization and coordinator of research on hygiene and toxicology of pesticides in our country."

Two deputy chiefs acquainted our correspondent in greater detail with the activities of the Center: Liliya Vladimirovna Selivanova, who heads the group for coordinating research and foreign relations, and Valeriy Nikolayevich Rakitskiy, chief of the department of hygiene and toxicology of pesticides.

Rakitskiy: Russia adopted from the Soviet Union the system of tests for registration purposes with virtually no changes. All orders for evaluation of products are forwarded to us through the Goskhimkom [State Chemical Commission] or Gossanepidnadzor [State Committee for Sanitary and Epidemiological Oversight].

Fomenko: In other words, the customers; they are also the developers of new products and they do not come out of nowhere?

Rakitskiy: Yes, they do come to us out of nowhere, but first we refer everyone to the Goskhimkom because only it can resolve questions of patentability, efficacy and promising future of an agent, etc., resolved. At the first stage, we must draw up a contract for expert evaluation. On the basis of the findings, a conclusion is offered as to whether the agent is promising from the toxicological and hygienic points of view. If the evaluation is positive, we prepare a program of research needed for complete evaluation of a pesticide; we determine what has to be additionally researched when a prior partial evaluation has been made. After this, if the customer so desires, we draw up a contract for an investigation.

Fomenko: Do the customers themselves pay for your work?

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Rakitskiy: Of course. Previously, registration research was carried out on a budget—the ministry allocated funds regardless of whether a domestic or imported product was studied. By the end of 1990, everything was converted to cost accounting. At present, we operate just like the whole world: whoever wishes to put his product on the market pays in full for its introduction.

Fomenko: What is the range of prices for such investigations at the present time?

Rakitskiy: It is difficult to discuss prices. They depend on numerous factors. However, there is a desire to elaborate standard pricing, if only to make them comparable at all institutes. But for the time being, customers look for the cheapest quotation, and they are not very fussy as to the quality of the studies. For expressly this reason, the Gossanepidnadzor certifies research institutions for the right to carry out toxicological and hygienic studies.

If we were to track the system of registering a product further, after the toxicological and hygienic studies the Center forwards its recommendations to Gossanepidnadzor where the final decision is made from the medical point of view, and all documents are submitted to Goskhimkom. The conclusions of biologists, beekeepers, fishery specialists, and results of agricultural production tests are also submitted to the latter. This system is similar to the one generally used in worldwide practice.

Fomenko: Do you have many orders at the present time to investigate domestic products?

Rakitskiy: Unfortunately, there are very few contracts for studies, and more for expert evaluations. On the one hand, this may be a good thing: it enables all laboratories of the Center to gradually join in the work. But I must say that we already have a good base for carrying out all types of studies.

Fomenko: Your potential customers cannot overcome the price barrier!

Selivanova: That is not the only thing. Many question the future of their products. Who can tell in our times whether there will be a market for a product, whether it can compete with foreign ones? There are so few who wish to draw up contracts with us that the institute has nothing to coordinate for the time being: we cannot transmit orders to other institutions. In essence, at the present time we are engaged in providing expert evaluation of foreign products.

Fomenko: Traditionally, in our country toxicological evaluation of imported protective agents was carried out following a complete program, which delayed registration for a long time. Opinions have been repeatedly voiced that it is not worthwhile to recheck data obtained by a firm using much more refined equipment and more precise methods than ours. What is the current official opinion on this score?

Selivanova: Indeed, up to 1982 every group of pesticides had to undergo a complete evaluation at VNIIGIN-TOKS. A change occurred when our scientists and specialists of the Ministry of Health became acquainted with the work of prominent firms and concluded that there is no need to repeat entirely the toxicological studies because the firms have a considerably better financial base. However, it was also learned that the most important hygienic aspects (that is, extent of real hazard of pesticide use to man and the environment) were often left unstudied. At present, this is how imported products are evaluated. We make an expert evaluation of the toxicological file submitted by the firm. If we do not concur in some regard, we request additional data, set up meetings with scientists, and hold discussions. We can also have our own opinion on some point and are entitled to conclude that we do not deem it possible to register a given product in our country on the basis of toxicological data. In addition to evaluating the file, we impose the mandatory demand for submittal of hygienic regulations, that is development of standards for permissible residual levels of pesticides in the air, water and foods. And, it must be said, Russian hygienists are stricter in the matter of regulation than foreign ones.

Fomenko: This is good to learn. But a pesticide travels from research laboratories into the real world. Where is the guarantee that there will be adherence to these strict standards? Apparently, someone should check this. What system is there at the present time for such checking?

Selivanova: Questions of hygiene of pesticides are within the purview of the system of institutions of Gossanepidnadzor. There are oblast and several rayon Gossanepidnadzor centers (former sanitary and epidemiological centers) with mandatory employment of specialists who check adherence to regulations for pesticide use. In our country a common system has been elaborated for monitoring residual amounts of pesticides in foodstuffs, water and air, with automated processing of data. Tens of thousands of tests are carried out each year using thin-layer, gas-liquid chromatography and polarographic techniques. Incidentally, not a single product can be used in our country without monitoring residual amounts thereof using a method that has been adjusted for our conditions. One of the main purposes of our Center is scientific implementation of a common methodology for evaluation of pesticides. Everything we develop is approved and put to use by Gossanepidnadzor.

Rakitskiy: If any objections arises in the course of our studies to a product that is already allowed, the Goskom [State Committee] immediately submits inquiries to Goskhimkom and, if necessary, prohibits its use in agriculture. If the local centers themselves find some negative toxicological consequences, they too are entitled to suspend the use of any drug and so inform Gossanepidnadzor.

Fomenko: What serves as cause and grounds for prohibiting a product already on the Allowed List?

Selivanova: Many widely used domestic products were first used in our industry in the 1960s-1970s. They were submitted to toxicological and hygienic evaluation to the extent of our knowledge at that time. Recently, hygienic requirements and capabilities of researchers have grown considerably. At the present time old products are being reviewed all over the world. In Europe, a list has been compiled of substances that should be studied on a modern level within five years. We too have begun such work, and there is already a list of domestic pesticides that require additional regulation. As demanded by Gossanepidnadzor, the manufacturer of a product must submit data on the results of additional toxicological studies. If there is no positive rating of the product, Gossanepidnadzor simply prohibits its production and use. These studies should be funded by the one concerned in continued release of the product.

Fomenko: What are the legal grounds for such action?

Rakitskiy: All rights and duties of our service are fixed in the Law on sanitary and epidemiological welfare of the people of the Russian Federation. Russia was the first of the independent republics to approve this document in 1991. In it, responsibility is placed for the first time on people, institutions, producers and local authorities for adherence to sanitary norms, including those applying the production, use of pesticides and sale of agricultural products with residual amounts of pesticides. In general, there is a system of preventive (prior to approval of any product) and ongoing (during use) oversight. In addition to us, such work is done by an agency of departmental control, the KTL [toxicological control laboratories?] that are well-known to all agronomists, which check adherence to technology for using products and carry out primary tests on them.

Fomenko: In your opinion, is the service for sanitary and epidemiological oversight sufficiently equipped to perform its tasks?

Selivanova: This has always been and is still a sore point. Oblast centers do, of course, have more modern and complex equipment at their disposal, whereas rayon centers make use essentially of thin-layer chromatography. Our service makes spot checks that enable us to assess the general condition of collective and state farm products. The only enormous and unresolved problem facing us today is the private sector. How is it to be checked? For the time being, we hope that State purchase of pesticides continues, and that the private sector cannot undertake any particular independent action in matters of product use. But what happens next?

Rakitskiy: This problem reminds us once more that a law on plant protection is the only thing that we need today in the system of developing regulations for use of products and monitoring adherence to them. It has been discussed for a long time, and a draft had been prepared in the Soviet Union times. The fact that it still does not exist makes work very difficult. At present the Russian

government has given a task (in the implementation of which we are also involved) to prepare a draft of such a law by the fourth quarter of this year.

Fomenko: How is interaction with CIS states developing in the matter of development and adherence to regulations?

Selivanova: The Gossanepidnadzor held a meeting of chief State physicians of CIS states, and all were in favor of having the same sanitary regulations. This is absolutely mandatory for both commerce and environmental protection. Of course, use of some product could be prohibited in one nation, for example Russia, but if it comes from abroad it will still contain such residues. This means that common approaches must be developed. Requests for additional information about the work of the Center for Hygienic Regulation of Chemicals Used in Agriculture may be addressed to 141000, Mytishchi Moscow Oblast, Semashko St. 2, MNIIG [Moscow Research Institute of Hygiene] imeni F. F. Erisman. Telephone 586-12-89.

Izdatelstvo "Kolos," "ZASHCHITA RASTENIY," 1994

Disease Control Must Be Intensified

957A0096B Moscow ZASHCHITA RASTENIY
in Russian No 4, Apr 94 (signed to press 24 Mar 94) p 5

[Article by S.S. Sanin, Deputy Director of VNIIF [All-Union Research Institute of Phytopathology]

[FBIS Translated Text] The phytopathological situation in the fields becomes extreme virtually every year. Recently, there has been a rise in incidence and harm of epiphytotic septorioses of grain crops. The disease is spread over virtually all regions of intensive grain farming, causing great loss of harvest and worsening of bread-baking and planting qualities of the grain.

Fusariosis of grain crops has become a major problem: fusariosis of the spike and *Fusarium nivale* invasion. Spike fusariosis is the most dangerous in the North Caucasus region, Central and North-Western regions of the Nonchernozem zone, in the Urals and Siberia. The quantity of fusarium-stricken grain in State deliveries has risen from 157,000 tons in 1981 (entire USSR) to 6,000,000 tons in 1992 (in the Russian Federation alone).

Due to the severe *F. nivale* invasion of winter wheat and rye in some parts of Russia, up to half the farmed areas are resown annually. The virus of stunted yellow growth and a set of fungal diseases of gray cereal crops (helminthosporiosis, rhynchosporiosis and others) have become widespread, and this worsened appreciably the feed base of the livestock industry and raw materials base of the brewing industry.

Mass outbreaks of rust and powdery mildew continue to cause serious loss of harvest.

In recent years, there has been an increase in damage done by phytophthorosis of potatoes. A severe epiphytotic was also observed last year.

Intensive type varieties imported from Holland—Fresca, Sante, Romane, and others—were stricken with particular severity. The earliest signs of disease appeared very early on these varieties and the original population of pathogens consisted mainly of an aggressive and extremely complex race with a high level of resistance to the fungicides used in our country.

At some farms, there were no certificates for seed material, so that there is reason to believe that, in a number of instances, the shipments of potatoes purchased abroad did not meet the necessary requirements, including extent of phytopathogen involvement. Plantations of these varieties, as well as of many phytophthorosis-susceptible domestic varieties under the conditions that developed required repeated use of fungicides. Two-three treatments administered at the farms were usually carried out with delay and could not provide for high potato productivity. This crop was also severely stricken in private plots which, as a rule, are not treated with fungicides.

The high susceptibility of many potato varieties to phytophthorosis and bacterial wet rot affected the shelf-life of tubers during storage and the quality of seed material. So that at the present time, in the spring, the chief concern is about future planting material from resistant varieties.

In general, it is time to change the attitude toward seed certification. Involvement of the State Commission for Varietal Testing should be increased in the matter of decision making concerning purchase of foreign varietal seeds.

What are we to expect this year? The cold and rainy weather of late fall, and the fuel shortage resulted in sowing winter crops on poorly prepared fields: in weed-infested fallow land, poorly treated nonfallow precursors. Moreover, a considerable part of the seeds was not treated.

Expert phytological evaluation of seeds was usually not made. Considering the severe involvement of grain crops in 1993 with septoriosiis, helminthosporiosis, and fusariosiis, we can assume that the seeds are severely infected and, as a result, it is possible under favorable conditions for the pathogens of devastating epiphytotics to develop in the next vegetation season. Such worsening of the phytopathological situation is also possible in potato fields and other crops. The situation is aggravated by the poor supply of pesticides at farms. Farmers are simply not in a position to acquire them because of their excessive cost. Evidently, it is imperative to establish a federal reserve of pesticides for use in extreme situations, otherwise local outbreaks of disease or pests appearing in some region or other could become a national disaster.

Izdatelstvo "Kolos," "ZASHCHITA RASTENIY," 1994

Terminology Must Be Precise

957A0096C Moscow ZASHCHITA RASTENIY in Russian
No 4, Apr 94 (signed to press 24 Mar 94) pp 6-7

[Article by Professor M. S. Sokolov, doctor of biological sciences, under the rubric: "Problems, Searches, Opinions"]

[FBIS Translated Text] Protection of plants as an applied science is based on several fundamental scientific disciplines. However, it has its own terminological lexicon and specific classification. In our opinion, a block diagram of current plant protection against pests could be subdivided into several interrelated directions (see Figure). Strategic directions—integrated protection, with its subordinate alternative (including biological) and chemical protection—are based on specific methods of protection (or methods of control, which is terminologically not as good).

Justifiably, integrated protection is now and will remain in the immediate future as the most viable, broadly practiced, and from the conceptual point of view it is the most comprehensive (see Figure). In this regard, it is opportune to recall the definition furnished more than 15 years ago by an FAO [Food and Agriculture Organization] expert commission and somewhat defined today. Thus, integrated protection is a system of organizing control of pests, which takes into consideration their dynamics and concrete environmental conditions, uses all methods and resources to keep the population of a harmful species below the economic threshold (cited from: R. S. Sagoyan and Ye. S. Sugonyayev, "ENTOMOLOGICHESKOYE OBOZRENIYE," 1986, No 4, p 668). According to a more recent definition (S. S. Izhevskiy and V. V. Guliy, "Slovar po biologicheskoy zashchite rasteniy" [Dictionary of Biological Plant Protection], Moscow, 1986, pp 77-78), "Integrated plant protection is a special approach to combined use of all available forms of suppression of a harmful species (including agrotechnological, chemical, biological and other methods, as well as natural regulation), which is used systematically in order to safely, effectively and at minimum cost keep populations of pests, pathogens of disease or weeds below the level that causes economic detriment (below the economic threshold of harmfulness)."

Methods of integrated protection are differentiated, first of all, by the arsenal of resources used that are intended to contain and regulate development of pests or "self-protection" of crops, trees and shrubs against numerous phytophages, pathogens and competitors. We should like to dwell in particular on biologically judicious chemical agents which we classified as ecological (ecologized) protection. The set of such agents includes dozens of names of biogenic compounds alone, which are similar in action to the harmful species. For example, the group

Integrations					
Ecological					
Alternative			Chemical		
Biological					
1 Agrotechn.					
2 Biocenotic	6 Allelopath		12 Autocidal bions Populations of sterilized organisms	16 Antidotes Protectants Synergists	
3 Mechanical	7 Antagonists Parasitoid Parasites		13 Virus-free plants Useful microorganisms based on "new" genes and plasmids	17 BAS & their ana- logues Microbial meta- bolites Superselective pesticides	20 Arboricides Herbicides Defoliants
4 Organiza- tional and administra- tive	8 Herbiphages Phytophages	10 Herbipatho- gens Mycobacteri- cides	14 Genetically resistant breeds, species, variants Transgenic plants	18 Immunity inductors PGR Phytoalexins	21 Bactericides Virucides Fungicides
5 Physical	9 Predators	11 Microbiologi- cal agents	15 Resistant hybrids, clones, varieties Polyspecies, polyvariet.	19 Cholines Phytoncides Phytotoxins	22 Attracticides Zoocides Insect-acari- cides
Pesticide- free methods	Resources of classic biological methods	"Extensive" biological agents	Products of genetic, and breeding, and biotech- nological methods	Biologically sensible agents	Pesticides with broad spectrum of action

of biologically active substances (BAS) and their synthetic analogue (box 17 [on chart]) used against arthropods includes a subgroup of regulators of insect growth and development (RIGD). It includes analogues of juvenile hormone (AJH, or juvenoids), antijuvenile agents (antiJH), analogues of ecdysic hormone (ecdysoids), anti-ecdysoids, chitin synthesis inhibitors, analogues of peptide hormones (neurohormones), and others. Another group of BAS includes various pheromones of arthropods (telergens, sex attractants, kairomones) (see: V. N. Burov and A. P. Sazonov, "Biologicheski aktivnyye veshchestva v zashchite rasteniy" [Biologically Active Substances in Plant Protection], Moscow, Agropromizdat, 1987). Various plant growth regulators (PGR), which alter their immune status are also represented rather fully (see: "Regulyatory rosta rasteniy" [Plant Growth Regulators], edited by G. S. Muromtsev, Moscow, Kolos, 1979), and this also applies to biogenic antimicrobial agents. The latter include so-called secondary metabolites of microorganisms (box 17)—bacteria, fungi, actinomycetes. These are antibiotics, siderophores, elicitors, suppressors, inductors of immunity, mycotoxins, exo- and endo-bacterial toxins, and others (see: M. S. Sokolov, AGROKHIMIYA, 1990, No 8, p 131; No 1, p 124). Attracticides are quite promising

and more ecological—mixed (or synthetic) preparations based on d.v. [active element?] of pheromonepesticide (with broad spectrum of action) and adhesive—box 22 (see ZASHCHITA RASTENIY, 1993, No 10, p 12).

The fact that we have referred biologically judicious chemicals (boxes 16-19) to the arsenal of ecological chemical protection cannot be interpreted similarly by all specialists. However, diverse pheromones, inhibitors of chitin synthesis, juvenoids, repellents and other BAS are obtained in large amounts by the synthetic method, i.e., *in vitro*. They are products of fine organic synthesis (like some peptides, ATP, antibiotics, microencapsulated bacterial endotoxins, and other compounds).

The tactics for protecting plants against harmful organisms are successfully implemented in a number of instances thanks to the rich arsenal of pesticide-free methods, among which the biocenotic one (box 2) is playing an ever increasing part. This is attributable to the fact that efforts to create purely artificial agroecosystems of utmost simplicity and without food chains turned out to be inconsistent.

However, biological protection agents are in all cases living organisms (including higher plants—allelopaths)

capable, to some extent or other, of reproducing their own kind, i.e., of reproduction in an agrobiocenosis. The principle of "the living against the living" can be applied to them in full measure. With this in mind, we have included among biological protective agents the products of genetic and breeding technologies, and biotechnologies, in particular transgenic plants (for example, pesticide-resistant predatory insects, glyphosphate-resistant plant varieties, as well as diverse microorganisms developed on the basis of foreign genes and plasmids) (boxes 12-15).

Contemporary second and third generation pesticides (boxes 20-22) are included in the arsenal of chemical and integrated protection agents. Unlike superselective pesticides (box 17), these are agents with a broad spectrum of action that destroy nonselectively both the pest and useful biota (if only a single species thereof). For this reason, integrated protection is not always and not fully ecological (for example, in the case of repeated treatment of gardens and vineyards with synthetic second and third generation insecticides and fungicides, combined with the use of pheromones or spreading trichogramma. This is not unexpected, since "the results of integrated protection systems are rated according to four criteria: decline in loss due to pests, diseases, and weeds; feasibility of measures; level of active effect on number of pests and economic acceptability." (S. S. Izhevskiy, V. V. Gulyi, 1986). With such an approach, the ecological criterion is not mandatory. On the other hand, chemical protection that makes use of only biologically sensible, ecologically safe agents is an ecological way of protection (see Figure). It also follows that the concepts of "biomethod" (classical) and "biological protection" are inadequate, while traditional pesticide-free protection (boxes 1-15) is alternative chemical protection (boxes 16-22).

Finally, we view the objects of protection against pests somewhat more broadly than it is traditionally believed. This refers not only to begetting plants, but also to their productive organs, and useful part of the harvest (i.e., seeds, fruit, tubers, mother plants, etc., i.e., plants that are stored or in the dormant period).

The results reported here of systematization and correction of directions and methods of plant protection are based on the results of discussions with Russian and foreign specialists, as well as critical analysis of data published by Americans (ARS National Biological control Program, Proc. Workshop Res. Priorities, USDA ARS, August 1988, 61 pp) and European conferences on biological protection ("Biological Plant Protection," symposium, 24 May 1991. Monheim Center for Plant Protection. "Plant Protection," NACHRICHTEN BAYER, 1992, 45, 1, 191 pp). True, purely semantic difficulties arise when referring to foreign sources, related to translation of English terms and absence of precise synonyms.

Our arguments and schematic organization of the lexicon on plant protection are not indisputable or final.

However, considering the information available at the present time, they seem to merit attention. We thank in advance readers who would like to voice their views on the issue in question.

Izdatelstvo "Kolos," "ZASHCHITA RASTENIY," 1994

Phytopathological Situation in 1994

957A0096D Moscow ZASHCHITA RASTENIY
in Russian No 4 Apr 94 (signed to press
24 Mar 94) pp 34-36

[Article prepared by specialists in the Russian Laboratory for Diagnosis and Forecasting]

[FBIS Translated Text]

Omnivorous Pests

Susliks: There is still a tendency toward decline in number and reduction in area inhabited by susliks. At the present time, in the range of susliks maximum density persists in Astrakhan, Volgograd, and Rostov oblasts, and Altay Kray. Treatment is administered to a lesser extent in Irkutsk, Chita and Amur oblasts, and in Kalmykia.

Muridae: The weather conditions in last year's vegetation period were generally unfavorable for development of this pest. The extent of measures to control mouse-like rodents diminished to one-half in 1993, as compared to 1992. This occurred as a result of significant reduction in pest population size in the spring of 1993, due to intensive treatments and adverse weather conditions in the zone of constant destructive activity—North Caucasus (Krasnodar and Stavropol krais, Rostov Oblast). In most of the range, the population was in a depressed state. In 1994, one must be particularly alert in Kabardino-Balkaria, Dagestan, Karachayev-Cherkesia and maritime regions of Krasnodar Kray. On the whole, however, no dramatic rise in population size of this pest on farm land is expected.

The **beet webworm** is presently in a phase of depression. Caterpillars of all generations of this pest populated only 10 percent of the examined farmland in isolated number. There are grounds to expect that the situation will not change this year.

However, considering the spontaneous nature of appearance of the beet webworm, and its potential high degree of harm, one should have a contingency reserve of insecticides for an area of 500,000 ha.

Last year's outbreak of reproduction of **locusts** was the severest in the last 20 years. There was considerable distribution on European territory of the **Italian locust** in Volgograd and Saratov oblasts and spotty distribution in Astrakhan Oblast, Kalmykia, Stavropol Kray and Dagestan. Frequent precipitation, preservation of a good feed base in the main habitat reservation on virgin land

and pastures, and development of a fungus infection—entomophthorosis were instrumental in diminishing the harm of this pest.

Nongregarious locusts presented a serious threat in regions of Siberia: Irkutsk, Chita oblasts, and Buryatia. There, mass development of this pest coincided with a lengthy drought. Partial loss of grain crops, hay fields and pastures was recorded. The pest was also active in Krasnoyarsk Kray, Khakasia and Yakutia, with spotty distribution in Magadan Oblast.

Considering the large hibernating stock of the pest, retention of sites of high density of locusts is expected in 1994 in the Volga Region (Volgograd, Saratov, Astrakhan oblasts, Kalmykia), in North Caucasus (Stavropol Kray, Rostov Oblast, Dagestan), and Siberia (Irkutsk and Chita oblasts, Krasnoyarsk Kray, Buryatia and Khakasia).

Among other omnivorous pests, **wireworms**, **turnip moth caterpillars**, and the **European cornborer** require close attention.

In central parts of Krasnodar Kray, significant harm is expected of **wireworms** in sugar beet fields. Focal treatment will be required against this pest in Rostov, Belgorod, Voronezh oblasts, Dagestan, Kabardino-Balkaria and North Ossetia.

The **European cornborer** is distributed in fields of corn, millet, and hemp in the Central Chernozem Region (particularly Belgorod Oblast), southern oblasts of the Center and in North Caucasus. Since the required set of agrotechnological measures aimed at destroying the pest is still not being carried out, there is no reason to expect a decrease in the harm it inflicts in 1994. Control of this cornborer will be implemented mainly by the biological method, by releasing trichogramma. For this purpose, it is desirable to use a new ecotype of the pyralid type trichogramma, production of which has been set up at the Belgorod Biofactory. Its efficacy constituted 66 percent when released twice and 54 percent with single release, whereas that of the turnip moth's efficacy is only 7 percent.

The weather conditions in the summer of 1993 were optimal for **turnip moth caterpillars**. Sites of increased damage done by them were noted in North Caucasus (Krasnodar Kray, Rostov Oblast, Adygeya, Kabardino-Balkaria). Invasion by this pest of grain crops (winter wheat, corn) is indicative of an increase in number of these phytophages this year on vegetable and row crops.

Pests and Diseases of Grain Crops

Stem fusariosis of winter wheat in North Caucasus has acquired the dimensions of an epiphytotic, particularly in Krasnodar Kray. The most stricken varieties were Krasnodarskaya 70, Olimpiya, and Soratnitsa. Efficacy of folikur, alto and impact spraying constituted 56-69 percent. Vomitoxin was discovered in grain in Krasnodar and Stavropol krays, Rostov Oblast, and Adygeya.

In 1994, involvement with **stem fusariosis** will depend mainly on temperature and humidity in the second half of the vegetation period, reserve of infection and varietal resistance.

The weather conditions were also favorable in North Caucasus for **septoriosi**s. Epiphytotic development was noted on some fields in Krasnodar and Stavropol krays, Rostov Oblast, Kabardino-Balkaria and Adygeya. The disease was widespread in Belgorod Oblast, and rises in its incidence were noted in Samara, Moscow, several regions of Omsk, Novosibirsk oblasts and Altay Kray.

In most regions of the republic there is still a tendency toward rise in disease in the form of spots, particularly **septoriosi**s and **helminthosporiosis**. In spite of profuse precipitation, the shortage of warmth retarded development of spots in the Nonchernozem Zone.

In the spring, the weather conditions (rapid disappearance of snow from fields, warmth, good ventilation of crops), as well as early resumption of field work, arrested winter crop damping. There was focal incidence of *Fusarium nivale*, and it was dispersed in some fields. However, focal death and thinning of crops due to soaking and formation of an icy crust were noted in some oblasts of the Nonchernozem Zone. Winter rye crops perished over considerable areas of Kirov Oblast. Winter grain crops in Krasnodar Kray were less stricken by mold than last year. In 1994, there could be widespread disease in oblasts and republics of the Nonchernozem Zone, Krasnodar Kray and focal involvement in TsChR [Central Chernozem Region], Volga and Ural regions.

Root rot of diverse etiology was distributed everywhere. The harm it inflicts is increasing in parts of Siberia and other regions, including North Caucasus (Krasnodar and Stavropol krays).

Manifestation of **brown rot** was mainly depressive and moderate; it was epiphytotic only in some fields (in Stavropol Kray, Kabardino-Balkaria, Karachayev-Cherkesia, Mariy El Republic, Bashkortostan, Yekaterinburg, Saratov, Samara, Penza, Ulyanov, Voronezh, Tambov and Kirov oblasts). No significant loss of harvest was noted because of late development.

Powdery mildew developed less strongly than last year. The exceptions were parts of Stavropol and Krasnodar krays, Bashkortostan, Tatarstan, Yekaterinburg, Saratov, Samara and Penza oblasts.

The humid weather during grain maturation, lodging, and extended harvesting period were instrumental in considerable involvement of the stem with **septoriosi**s, **alternariosi**s, and olive mold in several regions of North Caucasus, TsChR, Volga region and the Center.

Development of **smut** disease in 1994 will depend entirely on treatment of seed material. Infection of crops, particularly barley, is rather high, even in farms of Krasnodar Kray.

The intensity of development of diseases in grain crops this year will be determined primarily by the weather, as well as reserve of source of infectious, level of agrotechnology, timely and good protective measures. The situation will be aggravated this year because seed treatment was not carried out in full. Also, the fact that the grain crops started hibernating in mildly tillered or untillered condition with poorly developed root system, and that the winter crops were not completely sown will also have an effect. In many regions, such an effective procedure as spraying crops with fundazole in the fall was overlooked (with the exception of Tatarstan).

As before, the **stink bug** [*Eurogaster integriceps*] will be the principal pest of grain crops. Indicators of the physiological condition of hibernating bugs and their number indicate, however, that there are no grounds to expect a greater danger in 1994.

The importance of **beetles** [*Anisoplia*] has been declining since 1990. This year, their number will be appreciably smaller than in 1993 in all regions of their distribution. Evidently, chemical treatment will be needed in Volgograd, Yekaterinburg, Saratov, and Samara oblasts.

In spite of the annual extermination measures, the population of **cereal leaf beetles** [*Zabruis tenebriodes*] is growing. The reasons are poor harvesting grain crops (profusion of windfall), poor agrotechnology when preparing soil for winter crops, planting the latter over stalk precursors. For example, in Rostov Oblast more than 50 percent of winter crops are planted after grain crops.

Stage 2-3 larvae prevail in the hibernating population of this pest. Chemical treatment is mandatory when above-threshold quantities of these beetles are found.

One should also pay attention to the **striped cereal flea beetle** (southern parts of the Center, Volga-Vyatka, TsChR, Volga, Urals, Siberia), and **thrips** (Voronezh, Ulyanov, and Chelyabinsk oblasts). A large population of **wheat bulb fly** and harm will be inflicted by it in winter crops in the spring in parts of Volga-Vytaka, TsChR, and South Urals.

Pests of Leguminous Crops and Perennial Grasses

Bean and pea weevils will be the chief pests on pea fields, and they will inflict the greatest damage in dry warm weather, in the germination period. One should pay particular attention to protective measures in TsChR, Volga-Vyatka, Volga region, and several oblasts in the Center.

In TsChR, the Center, Volga region, and North Caucasus, the deleterious effect of **pea aphids** will be manifested in warm humid weather; the large population of these aphids is particularly dangerous from the budding phase to complete development of harvest.

The tendency toward increase in number and expansion of the range of the **pea beetle** will persist. The annual loss of peas during harvest is instrumental in preserving up to

45 percent of the hibernating stock of this pest in its natural habitat (Belgorod Oblast, Bashkortostan).

A considerable stock of the pest in gathered harvest was noted in several oblasts of TsChR, and Volga region—15-20, the maximum being 400 specimens per kilogram seeds (Voronezh and Samara oblasts). The entire sowing material which was not certified for the pea beetle contained more than 10 specimens/kg and requires fumigation.

The **pea moth** will continue to be very damaging in TsChR (Voronezh, Lipetsk, Tambov oblasts), Volga region (Samara Oblast, Tatarstan) and Bashkortostan. There may be focal hazard in other regions.

Clover and alfalfa grown from seeds can be damaged by **bean and pea weevils**, **clover leaf weevils**, **apions**, **Thychius seed-eating weevils**, and **bugs**.

Potato Pests and Diseases

As before, the **Colorado beetle** will be dangerous in its regular range; it will be necessary to treat 80-85 percent of the populated area. The importance of the **28-spotted ladybird** will continue in the Far East.

Phytophthorosis. Last year, epiphytotic development of the disease (40-100 percent spread, 25-80 percent development) was noted in Kabardino-Balkaria, Bryansk, Kaluga, Orlov, Vladimir, Moscow, Pskov, Novgorod, Perm, Nizhniy Novgorod, Smolensk and Kaliningrad oblasts. By the middle of August the disease reached epiphytotic development in all of the main potato-sowing regions, which caused premature loss of tops. Severe overwatering of the soil caused the infection to move to the tubers. Analysis of tubers in the fall revealed that 1-37 percent were stricken with phytophthorosis (2 percent is allowed). In view of this, it is imperative to plan for treating fields three or four times.

Sunflower and Flax Pests and Diseases

Root, stem and anthodium forms of **white rot** were found in TsChR, Volga region and North Caucasus. **Gray rot** was recorded in TsChR, Volga region, Rostov Oblast and Kabardino-Balkaria. This year there could be strong development of rot in TsChR and the Volga region.

Of all pests, the greatest damage can be inflicted by **beet pests**, **wireworms** and **false wireworms**.

In all flax-growing regions, a hazard to the crops will be presented by the **flax flea beetle** particularly in dry warm weather, in Kirov, Nizhniy Novgorod and Pskov oblasts. Seed treatment with thigam is a good control measure. Diseases such as fusarium-induced wilt, spot, bacteriosis, and polysporosis may occur during vegetation.

Fruit and Grape Pests and Diseases

In areas of commercial fruit-growing, the **codling moth** and **tortrix moths** will continue to be the main pests; **scab**

and powdery mildew will be the chief diseases. A tendency toward increase in damage done by fruit tree spider mite will persist in a number of regions of the Center and North Caucasus. In more northerly regions, damage will be done by the apple-blossom weevils, suckers, and sawflies.

In vineyards, the European grape moth, mites (spider and itch mites) will present a danger; so will *Otiorrhynchus* in isolated spots.

Last year, oldium inflicted considerable damage to the harvest in Krasnodar Kray and Dagestan. The disease struck Rkatsiteli, Riesling, Ranniy Magarach and Cabernet varieties with particular severity. Under favorable weather conditions, one should expect strong development of grape oldium and mildew this year as well.

The scope of protective treatment of sugar beets will be narrower on land where seeds were treated with carbosulfan-based insecticides. The beet bug will continue to be a danger for seed plants in Voronezh Oblast.

Izdatelstvo "Kolos," "ZASHCHITA RASTENIY," 1994

Synthetic Anticonvulsants, Antihypoxants, and Inductors of the Monooxygenase System of the Liver Based on Amides and Urea. XII. Study of the Enzyme-Inducing Activity of N-Aralkyl-N'-Acylurea

910A0100A Moscow

KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Vol 28 No 3 Mar 94 (manuscript received
25 Feb 93) pp 30-31

[Article by A.A. Bakibayev, R.R. Akhmedzhanov, L.G. Tignibidina, T.P. Novozheyeva, V.V. Shtrykova, V.D. Filimonov, N.S. Dobychina, and A.S. Saratkov, Tomsk Polytechnic University and Siberian Medical University, Tomsk]

[FBIS Abstract] Twenty-Four N-aralkyl-N'-acylureas of the formulas PhCHMeNHCONHCOR , $\text{RC}_6\text{H}_4\text{CH}_2\text{NHCONHCOR}$, and $\text{Ph}_2\text{CHNHCONHCOR}$ were evaluated for their effect on the hepatic cytochrome P-450-dependent monooxygenase system in a hexobarbital-induced sleep test of mice. Introduction of acyl groups on the end nitrogen atom of the α -phenylethylurea molecule confers on some of them the property of accelerating hexobarbital metabolism *in vivo* and shows the same enzyme-producing effect on the monooxygenase system of the liver of experimental animals. In contrast to their anticonvulsant properties, the compounds studied (with one exception) changed their enzyme-inducing activity antibatically in base-catalyzed hydrolysis. In contrast to N-benzylurea itself, the compounds in the second group with a benzoyl group on the nitrogen atom reduce the length of hexobarbital sleep independently of the substituent and its location in the benzoyl radical. Replacement of the benzyl group in benzylureas by an aliphatic group lowers the activity. Several N-benzhydryde-N'-acylureas synthesized showed reduced activity.

Thus, acylation of benzylureas, α -phenylureas, and benzhydrylureas produces contradictory effects. The first two groups of compounds synthesized have enzyme-inducing properties, but the last results in a marked decrease in enzyme-inducing properties. Table 1; references: 4 Russian

Polymeric Biodegradable Hydroxamic Acids for Removal of Iron From the Organism

957A0100B Moscow

KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Vol 28 No 3 Mar 94 (manuscript received
23 Feb 93) pp 31-34

[Article by A. Yu. Meshchanov, G.N. Koltsova, L.T. Minina, V.A. Gorodkova, I.V. Smirnov, and V.N. Boventko, Hematological Science Center, Russian Academy of Medical Sciences, Moscow]

[FBIS Abstract] Hydroxamic acid derivatives have been used previously to remove pathological iron from blood, but the compounds have been either short acting or have not been biodegradable in the organism. In this study, polymers of hydroxamic acid were obtained by oxidizing dextran with periodate to form dialdehyde dextran, which was then caused to react with ϵ -aminocaprohydroxamic acid and then reduced by sodium borohydride. In this way N-dextrano- ϵ -aminocaprohydroxamic acids were synthesized which contained 5 to 37 hydroxamic acid groups per 100 monomer units of the polymer (g). In tests on mice the maximal value for removal of iron was at g = 33-37. However, biodegradation decreases with an increase in g. Tests of biodegradability with 1,6-dextran glucosidase showed that the optimal ratio is 30-35 hydroxamic groups per 100 monomeric units. Figure 1; references: 6 Russian, 9 Western.

Antimicrobial Effect of Mixed-Ligand Complexes Based on Tridentate Imines and Thiosemicarbazones of Salicylaldehyde

957A0100C Moscow

KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Vol 28 No 3 (manuscript received
17 Dec 92) pp 34-37 Mar 94

[Article by K.N. Zelenin, O.B. Kuznetsova, A.G. Saminskaya, V.V. Alekseyev, Z.T. Karimov, Ye. P. Sivolodskiy, G.A. Sofronov, N.I. Novikov, and T.N. Preobrazhenskaya, Military Medical Academy imeni S.M. Kirov, St. Petersburg]

[FBIS Abstract] Complexes based on imines of salicylaldehyde with o-aminophenol and o-aminothiophenol and of the 4-phenylsemicarbazone of salicylaldehyde were synthesized and tested against 24 microbes. Copper and nickel complexes of the 4-phenylthiocarbazone of salicylaldehyde were found to have significant antimicrobial activity against gram-positive microorganisms,

similar to that of tetracycline. The nickel complex with sulfanilamide as an additional ligand was more active than streptocide and was effective against both gram-positive and gram-negative microorganisms. Unfortunately, the class of biologically active complexes is highly toxic. Tables 3; references: Russian 10 Western 7.

Comparative Study of the Antiarrhythmic Effect of Bonnecor and Some Derivatives of Mesidides of α -Azacycloalkanecarboxylic Acids

957A0101A Moscow *EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian* Vol 57 No 3 May-Jun 94 (manuscript received 11 Nov 93) pp 15-17

[Article by N. Sh. Paliani-Katsitadze, S. Yu. Berdyayev, A.I. Turilova, N.V. Kaverina, and A.M. Likhoshervostov (Research Institute of Pharmacology, Russian Academy of Medical Sciences, Moscow)]

[FBIS Abstract] Study of new highly effective antiarrhythmic substances has been conducted jointly by the Pharmacology Research Institute of the Russian Academy of Medical Sciences and the Arneimittelwerk of Dresden in two directions. Among derivatives of tricyclic nitrogen-containing systems tested, bonnecor, a dibenzazepine derivative, was found to have antiarrhythmic and antifibrillation properties.

The second direction of research was to study derivatives of local anesthetics. Derivatives of mesidides of α -azacycloalkanecarboxylic acids which differed in the character of the substituent on the nitrogen atom and also in the character of the salts (tertiary or quaternary) were tested on rabbits, rats, and cats. Bonnecor was found to have a higher antiarrhythmic activity in most arrhythmic models, exceeding not only novocaine amide but also lidocaine. Tertiary and quaternary salts of mesidides of α -azacycloalkanecarboxylic acids were superior to bonnecor in the suppression of arrhythmias produced by aconitine. The tertiary salts were found to be more active than quaternary be a factor of three. Tables: 4; references: 11 Russian 5 Western.

Reaction of the Vascular Coating of the Eye to Chronic Exposure to Radiation Factors of the Chernobyl Nuclear Electric Power Plant Accident

957A0102A Odessa *OFTALMOLOGICHESKIY ZHURNAL in Russian* No 5 May 94 (manuscript received 30 Sep 93) pp 302-305

[Article by N. Ye. Dumbrova, doctor of medical sciences, Institute of Eye Diseases and Tissue Therapy imeni V.P. Filatov, Ukrainian Academy of Medical Sciences]

[FBIS Abstract] Eye tissue taken from 12 white rats which had been exposed to radiation in the 30 kilometer zone around Chernobyl was studied to determine the state of structural components of the eye.

Changes are observed in 3-month old animals, primarily in the field of choriocapillaries. Destructive changes appear in the intercapillary connective tissue, endothelial cells show indications of the activation of protein synthesis of a compensatory character, and there is a sharp increase in the permeability of the vascular walls, especially of the choriocapillaries, with saturation of their colloidal parts with blood plasma.

In 6-12 month old irradiated animals, atrophy of the endothelium of the choriocapillaries in several parts of the vascular coat is noted. The number of vessels diminishes. In isolated parts an apparently compensatory growth of choriocapillaries appears that penetrates into the area of pigmented epithelial cells. Changes in the structure and function of choroidal elements lead to the pathology of the pigmented epithelium and the development of retinal dystrophy. Figures 2; references: 7 Russian.

Study of the Effect of Low-Intensity Laser Radiation on the State of an Organ Culture of the Crystalline Lens

957A0102B Odessa *OFTALMOLOGICHESKIY ZHURNAL in Russian* No 5 May, 94 (manuscript received 12 Feb 93) pp 306-308

[Article by E.V. Maltsev, doctor of medical sciences, L.A. Linnik, professor, and I.N. Ganichenko, candidate of medical sciences, Institute of Eye Diseases and Tissue Therapy imeni V.P. Filatov, Ukrainian Academy of Medical Sciences]

[FBIS Abstract] Helium-neon and argon lasers were used separately and in combination to study the effect of low-intensity laser radiation on the generation of cataracts of the crystalline lens. Sixty-eight organ cultures of cattle were used, of which 25 were controls. It was found that the monocoherent light of a laser exerts no inhibiting action on the character, appearance, and progression of lens opacities. In addition, no harmful effects were recorded in these *in vitro* experiments contrary to the results of a previous study of naphthalene cataracts. Further study is recommended of the possibility of using laser therapy for cataracts of a different and more common etiology, especially those initiated by primary damage of the lens epithelium. Tables 2; references: Russian 11, Western 1.

Electroencephalographic Correlates of Neurological Disturbances After an Extended Period of Time After Exposure to Ionizing Radiation (Consequences of the Chernobyl Nuclear Power Plant Accident)

957A0120A Moscow *ZHURNAL VYSSHEY NERVOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian* Vol 44 No 2 Mar-Apr 94, (manuscript received 7 Dec 92; accepted 18 Mar 93) pp 229-238

[Article by L.A. Zhavoronkova, N.B. Kholodova, G.A. Zubovskiy, Yu. N. Smirnov, Yu. M. Koptelov, and N.I.

Ryzhov, Institute of Higher Nerve Activity and Neurophysiology, Russian Academy of Sciences, Institute of Diagnostics and Surgery, Russian Academy of Medical Sciences, Moscow]

[FBIS Abstract] The psychological status was evaluated of 40 male patients age 25-45 who had received an official dose of 15-51 rems from participating in the cleanup after the Chernobyl accident. They complained of constant headaches, frequently of a diffuse character, general weakness, rapid fatigue, sexual debility, sleep disturbance in the form of daytime drowsiness and nighttime insomnia, and aching bones. They also complained that they could not tolerate solar radiation or high environmental temperatures. Eight had a subfebrile temperature, 7 had frequent nosebleeds, and 23 had paroxysms with loss of consciousness or local convulsions. The control group consisted of 20 healthy men. Neurological examination of the patients revealed vegetative-vascular and endocrine dysfunctions as well as diffuse neurological symptoms. The EEG of one group of patients (25 persons) was characterized by slow alpha- and theta-band foci and epileptic waves in the central-frontal regions; epileptic sources were localized at the diencephalic level mainly in the midline being shifted to the right hemisphere. The EEG of another group (15 persons) had delta waves in the frontal regions and a background of diffuse beta-activity. The sources of the epileptic activity of a diffuse character were localized at the basal level of the brain and in the cortex (predominantly) in the left hemisphere. The findings are compared with the previously obtained results of X-Ray and computer tomography studies. Figures 3; references: 16 Russian 8 Western.

Participation of Cardioactive Peptides in Habituation and Sensitization of the Synaptic Response of Command Neurons of the Behavior of the Snail

957A0120B Moscow ZHURNAL VYSSHEY NERVOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 44 No 2 Mar-Apr 94 (manuscript received 24 Sep 92; accepted 18 Mar 93) pp 301-306

[Article by N.I. Bravarenko, Institute of Higher Nerve Activity and Neurophysiology, Russian Academy of Sciences, Moscow]

[FBIS Abstract] Small cardioactive peptides (SCP) are a class of neuropeptides which have a low molecular weight (less than 2000) and are capable of stimulating the activity of the heart and pharynx muscles of gastropods. They are observed in many gastropod species. Many peptides which are endogenous to invertebrates are also biologically active in higher animals. Two forms of SCP exist, SCPa and SCPb. The application of SCPb at a concentration of 5×10^{-8} M in saline solution results in a significant increase in the amplitude of the summary excitatory postsynaptic potential elicited by intestinal nerve stimulation in the command neurons for withdrawal reactions. Serotonin exerts comparable effects at

a concentration of 10^{-6} M. The application of FMRFamide, a molluscan cardioexcitatory neuropeptide at a concentration of 10^{-6} M significantly decreases the amplitude of the synaptic response to a single stimulus. The effect of FMRFamide is completely contrary to the action of serotonin and SCPb both in its effect on the amplitude of a single response and in its action on the rate of habituation of neuron responses. The data indicate the independence of subcell mechanisms of habituation and sensitization. Figures 5; references: 4 Russian 11 Western.

Participation of the Endogenous Opioid System in the Regulation of Feeding and Protective Behavior of the Mollusk *Lymnaea stagnalis*

957A0120C Moscow ZHURNAL VYSSHEY NERVOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 44 No 2 Mar-Apr 94 (manuscript received 29 Oct 92; accepted 18 Mar 93) pp 316-322

[Article by V. Ye Dyakonova and D.A. Sakharov, Institute of Developmental Biology imeni N.K. Koltsov, Russian Academy of Sciences, Moscow]

[FBIS Abstract] The role of the opioid system on the organization of the feeding and protective behavior of the pond snail *Lymnaea stagnalis* was studied. Morphine increased the amount of food consumed; the size of the holes in the leaf blades increased and their number decreased. Naloxone decreased the amount of food consumed; the size of the holes in the leaf blades decreased and their number increased. Morphine weakens the response to tactile stimulation, but naloxone increases the number of spontaneous protective reactions. Evidence is presented that the feeding program is influenced by opiates indirectly. The endogenous opioid system seems to control directly a defensive fixed motor action accompanied by an arrest of feeding activity. Figures 4; references: 3 Russian 17 Western.

Effect of the Delta Sleep-Inducing Peptide and Serotonin on the Neurons of the Grape Snail

957A0120D Moscow ZHURNAL VYSSHEY NERVOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 44 No 2 Mar-Apr 94 (manuscript received 13 May 92; accepted 20 May 92) pp 342-347

[Article by L.D. Karpenko, Ye.V. Aroyan, A.M. Mendzheritskiy, and N.N. Filin, Institute of Neurocybernetics, Rostov State University, Rostov-on-Don]

[FBIS Abstract] The effect of delta sleep-inducing peptide and of serotonin on the excitability and on the spontaneous activity of eight identified neurons of the snail *Helix lucorum* L. was studied. In experiments on semi-intact preparations it was established that sleep-inducing peptide spontaneously inhibits active neurons and reduces the responses of silent cells to depolarizing currents and tactile stimuli. The effects were dose-dependent. The sensitivity of different neurons to the same doses of the peptide is not identical.

Serotonin excited the neurons, and these results suggest that sleep-inducing peptide does not affect the small neurons via the serotonin system. The hyperpolarization effect of the peptide may be due to the enhancement of Cl conduction or to changes in adenylate cyclase activity. An alternative explanation is that peptide may influence the process of synaptic transmission. Figures 3; references: 14 Russian 11 Western.

Delayed Defensive Reflexes in Dogs After Systemic Injection of Leu-Enkephalin

957A0120E Moscow ZHURNAL VYSSHEY NERVENNOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 44 No 2 Mar-Apr 94 (manuscript received 5 Mar 93; accepted 19 May 93) pp 357-359

[Article by M.K. Ryzhakov, V.N. Kalikhevich, and I.A. Zhuravin, Institute of Evolutionary Physiology and Biochemistry imeni I.M. Sechenov, Russian Academy of Sciences, Saint Petersburg, Saint Petersburg University]

[FBIS Abstract] Three mongrel dogs of both sexes were exposed to noise (10s, 20 KHz, 65 decibels from a generator) as a conditioned stimulus and to electrode stimulation of the skin (0.5-7 mA, 1s) as an unconditioned stimulus. The parameters of movement reactions, pulse rate, and respiratory rate were recorded and analyzed by computer.

Leu-enkephalin in a dose of 100 µg/kg in a physiological solution was injected subcutaneously in a single dose in two series of experiments with a two-month interval. The delayed reactions were tested for 18 days. On the whole, single administration of leu-enkephalin produces a shift in the vegetative indicators (a change in the respiratory rate and pulse rate) and a cyclic change in the movement components of the defense reflex in the dog under conditions with a negative emotional baseline. The data obtained are difficult to interpret because it is known that enkephalins are rapidly destroyed by blood peptidases. The results can probably be explained by the cascade effect of regulator peptides. Figure 1; table 1; references: 5 Russian 2 Western.

Indication of Skin Microflora as a Test To Forecast Acute Morbidity in Mass Screening of Workers

957A0127 Moscow MEDITSINA TRUDA I PROMYSHLENNAYA EKOLOGIYA in Russian No 9 Sep 94 (manuscript received 5 Feb 93) pp 37-40

[Article by A.A. Ivanov, A.N. Ignatov, G.A. Shalnova, A.M. Ulanova, T.D. Kuzmina, Institute of Biophysics, Ministry of Health of the Russian Federation, Moscow]

[FBIS Abstract] The presence of skin automicroflora is a reflection of the overall condition of the individual, his

immune reactivity, and his ability to resist infection. The incidence of acute respiratory illness and exacerbation of some chronic illnesses was studied in relation to the presence of skin surface automicroflora. No immunological tests other than the skin automicroflora test were used. There is a direct relation between the amount of autoflora skin microbes and the number of cases of future morbidity. The use of a skin automicroflora test for mass screening of apparently healthy people makes it possible to predict severe morbidity in the course of the first month after the screening. The most vulnerable groups and groups of individuals with a high anti-infection resistance can be isolated on the basis of the test level. Tables 3; references 8 (Russian).

Recovery of Cell Cultures After Storage in a Deeply Frozen State

957A0129A Moscow VETERINARIYA in Russian No 11 Nov 94 pp 26-28

[Article by B.T. Stegnyy, Institute of Experimental and Clinical Medicine, Kharkov]

[FBIS Abstract] For veterinary laboratory practice and research it is necessary to develop effective methods of long storage of biological preparations at very low temperatures (-196°C). The purpose of this investigation was to study the morphological, cytogenetic, culture properties, bioenergy processes in cell cultures, and also the optimal conditions for preparation for cooling and the restoration of cells from the frozen state.

For the experiments initially trypsinized fetal kidney cells of cattle and swine, the embryonic kidney cells of birds, and spleen cells of mice were studied. Of the traditional cryogenic protectors, DMSO, 1, 2, 3-propanediol, hydroxyethylated glycerol, and ethylene glycol in a final concentration of 7-10 percent were most effective. Particularly effective was a combination of DMSO, 1-2-propanediol and hydroxyethylated glycerol possessed the least cytotoxicity. During the first two years of culturing in a fresh nutrient medium, the mitotic activity in comparison with the control decreased by a factor of 3-4. The amount of pathological forms of mitosis increased substantially. Programmed freezing of the culture cells under the protection of a cryogenic protector produced a reduction in the level of endogenous respiration by 25 percent. Endogenous respiration was stimulated by increasing the sodium succinate content. Addition of 2, 4-dinitrophenol increased respiration by only 30 percent. The optimal freezing conditions produced a lowering of the ATP level by at least 15 percent.

After cryogenic conservation of the cells a decrease in total transport of ⁸⁶Pb⁺ (an analog of K⁺) by 48 percent and an increase in passive diffusion of the cation by 17

percent were observed. This is related to the impoverishment of the energy substrates of the cell and a drop in the level of macroergs in the freezing-thawing process. The degree of sensitivity to viruses remained unchanged.

For optimum restoration of the cells, special preparation of the surface of the culture vessels and the use of enriched nutrient media are required to create favorable conditions for adhesion of the cells to the substrate surface, their subsequent spreading, and proliferation by means of stimulation of biosynthetic and energy-dependent processes, including the repair of sublethal damage. Figures 3, table 1, references: 14 Russian.

Comparative Characteristics of Regeneration of the Lens and Limb in Newts Operated on Before and After Orbital Spaceflight

957A0131A Moscow IZVESTIYA AKADEMII NAUK. SERIYA BIOLOGICHESKAYA in Russian No 6 Nov-Dec 94 (manuscript received 29 Mar 94) pp 859-869

[Article by S.Ya. Tuchkova, N.V. Brushlinskaya, E.N. Grigoryan, V. I. Mitashov, Koltsov Institute of Developmental Biology, Moscow; UDC 59:596/599]

[FBIS Abstract] It has been established that spaceflight affects the newt *Pleurodeles waltlii* operated on before spaceflight. There is a tendency toward synchronization and acceleration of regeneration of the forelimb and lens. This paper presents results obtained after a 16-day spaceflight. There were two experimental groups of newts. In group one, 14 days before the flight the forelimbs were amputated, and seven days before the flight the lenses were removed. The intact animals in group two, which also flew, were operated on the day the spacecraft landed. Regeneration in both flight groups and the corresponding synchronous ground control groups was studied in the same period after the operation. Morphological criteria are used to evaluate the rate of regeneration. In the control and experimental groups, morphological stages of regeneration were compared. Marked ^3H -thymidine nuclei of bud cells of the forelimb and cells of the vestige of the lens were used, as well as morphometry of lens regeneration. Accelerated regeneration of the forelimb and lens occurred in both groups. In the second group in comparable stages there was a more than two-fold increase in the index of marked ^3H -thymidine bud cells compared with the control. The size of lens regeneration in groups one and two of the flight groups clearly exceeded the control. The results indicated the prolonged character of the effect of spaceflight on regeneration of the forelimb and lens. In spaceflight conditions the lens reached more advanced stages of regeneration compared with regeneration in ground conditions (in intact newts operated on after spaceflight). The accelerated regeneration may be due to changes in the skeleton and muscle caused by space conditions and the acceleration of the release of cellular elements involved with the formation of buds. The

results also indicate an increased rate of regeneration in lower vertebrates. Figures 5; tables 3; references 34: 19 Russian, 15 Western.

Evaluation of the State of Land Ecosystems in the Impact Regions of the North

957A0131B Moscow IZVESTIYA AKADEMII NAUK. SERIYA BIOLOGICHESKAYA in Russian No 6 Nov-Dec 94 (manuscript received 1 Nov 93) pp 907-913

[Article by V. M. Igamberdiyev, State Scientific Research Institute of Environmental Protection of the Arctic and North; UDC 502.55.001.3.(985)]

[FBIS Abstract] On 14 June 1991, eight Arctic nations signed a declaration on environmental protection which included a monitoring and evaluation program. There is a methodology for monitoring pollution itself, but little emphasis has been placed on monitoring the effects of pollution. Various approaches have been suggested, and this paper tries to synthesize these approaches to evaluate the state of land ecosystems of the North subjected to anthropogenic pollution. A system of terminology is developed. The procedure for analysis and evaluation of the state of the ecosystems is outlined. Emphasis is placed on cases where pollution is accompanied by a clear toxic ecological effect. The principal role of biological indicators is noted. It is important to select the correct indicators. Suitable indicators are classified and requirements for use are formulated. References 15: 12 Russian, 3 Western.

Intensity of Septorioses Symptoms in Wheat Previously Infected With Fusarial Root Rot

957A0131C Moscow IZVESTIYA AKADEMII NAUK. SERIYA BIOLOGICHESKAYA in Russian No 6 Nov-Dec 94 (manuscript received 15 Sep 93) pp 949-951

[Article by N.B. Troshina; UDC 632.4]

[FBIS Abstract] Intensity of septorioses symptoms is evaluated in the second leaf of wheat plants after previous inoculation with *Fusarium graminearum*. In weak infection, intensity of symptoms is lower than in the control, indicating relative resistance of plants to repeated infection. This effect is absent in strong infection. Strong infection leads to a profound infection of cortex cells and the parenchyma of the conducting system of the stem base. It is possible that accumulation of mycelia in these tissues may prevent passage of the "signal" that induces an increased resistance to septorioses. Induction of plant resistance to septorioses agent is not observed. Table 1; references 9: 4 Russian, 5 Western.

Growth and Mobility of Cells Invitro in Microgravity. The Fibroblast Experiment

957A0133A Moscow IZVESTIYA AKADEMII NAUK. SERIYA BIOLOGICHESKAYA in Russian No 5 Sep-Oct 94 (manuscript received 10 Dec 93) pp 745-750

[Article by M.G. Tairbekov, L.B. Margolis, B.A. Baybakov, A.V. Gobova, G. B. Dergacheva, Institute of Medical and Biological Problems of the Ministry of Health of

the Russian Federation, Moscow, Institute of Physico-Chemical Biology, Moscow State University; UDC 576.342]

[FBIS Abstract] The Fibroblast experiment was flown on the Kosmos-2229 satellite at the end of December 1992. The Biobox on-board device, commissioned by the European Space Agency and manufactured by Dornier, was used. The main purpose of the experiment was to find molecular mechanisms for the effect of altered gravitational force, including microgravity, on a cell. The specific goal of the experiment was to study the properties of the growth and mobility of cells in a monolayer culture on a solid substrate and in a three-dimensional histoculture on a special substrate, a collagen sponge. Connective tissue cells from mouse embryos were cultured. The active phase of the experiment lasted 48 hours during spaceflight. The biological material was then fixed, the temperature reduced and the material held for ten days in storage mode until the conclusion of the flight. Results of post-flight analysis are presented. Analysis involved tracer technology, histological cross sectioning, light and electron microscopy. Spaceflight is found to have a noticeable effect on the morphological characteristics of cell culture. Flaws in the handling of the monolayer culture are noted. In the monolayer culture the average area of nuclei was a factor of two smaller in the flight cell culture than the control. The length and width of the nuclei decreased (they became more round). In the three-dimensional culture, the size of nuclei was smaller than the control (42%) but the width to length ratio was the same. It is possible that in the monolayer culture reduced gravity kept the cells from being pressed flat by their own weight or the weight of the medium. A retardation of cell growth and division was observed. A drastic decrease in gravity may cause substantial changes in the morphological character and functional activity of cells grown on a solid substrate. It is believed that this may be due to weakening of intercellular contacts and cell adhesion to the substrate (in particular, in the histoculture). However, the experiment did not yield a conclusive answer on the possibility of a direct effect of gravity on cells. Tables 2; references 8: 1 Russian, 7 Western.

Intense Interrupted White Light as a Factor in Increasing Adaptive Introduction and Mutagenesis in Wheat

957A0133B Moscow IZVESTIYA AKADEMII NAUK. SERIYA BIOLOGICHESKAYA in Russian No 5. Sep-Oct 94 (manuscript received 22 Nov 93) pp 788-801

[Article by S.A. Stanko, Semenov Institute of Chemical Physics, Russian Academy of Sciences; UDC 535.212:631.531.173.4]

[FBIS Abstract] Irradiation of seeds and apical meristems of short photoperiod dwarf wheat with intense interrupted white light changes the genetic basis of their photoperiod response and provides adaptive introduction into regions with a long photoperiod. The optimal

dose per irradiation procedure is a total of 15×10^9 to 30×10^9 J/m². To amplify modification and mutation processes the optimal dose is 45×10^9 to 90×10^9 J/m². The number of photo-induced free radicals in seeds is linearly dependent on irradiation energy until it reaches a saturation plateau at around 50×10^9 J/m². By activating structural, metabolic, photoenergy, and mutation processes, intense interrupted white light causes photo-destruction and photoinactivation of endogenous inhibitors and promotes synthesis of growth stimulants and the formation of photo-induced free radicals. Some of the free radicals in the water phase of cells form peroxide and hydroxyl radicals which are powerful mutagens causing point mutations. In the second to fifth generations about 65% of the morphogenetically constant high productivity mutant forms have a better seed quality and good adaptation to a long photoperiod. Figure 1; tables 4; references 3 2: 30 Russian, 2 Western.

Intracellular Location of Epitopes of Two Monoclonal Antibodies Against the Val⁹²⁸-Lys⁹⁴⁵ Fragment of the α -Subunit of Na⁺, K⁺-ATPase: Application to Construction of Topologic Model

957A0135A Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 11 No 6, Nov-Dec 94 (manuscript received 30 Sep 93) pp 605-613

[Article by D. I. Larin, M. I. Shakhparonov, E. Ortiz, M. B. Kostina and N. N. Modyanov, Bioorganic Chemistry Institute imeni M. M. Shemyakin and Yu. A. Ovchinnikov, Russian Academy of Sciences; UDC 577.152.361*38]

[FBIS Abstract] Na⁺, K⁺-ATPase is an indispensable component of plasmatic membranes of eukaryotic cells ensuring active transport of univalent cations. The two subunits of the enzyme are integral membrane proteins and their structural organization is characterized by a clearly expressed asymmetry. Clarification of the mechanism of functioning of Na⁺, K⁺-ATPase necessitates study of the location of its polypeptide chains relative to the cytoplasmatic membrane. Many research efforts have been directed to solving this problem, resulting in proposal of a number of two-dimensional models of the spatial organization of the subunits of Na⁺, K⁺-ATPase in a membrane. However, the organization of the COOH-terminus half of the polypeptide chain, playing a decisive role in the linking and transport of cations, has remained unclear. In particular, according to the proposed models the mentioned fragment of the α -subunit of Na⁺, K⁺-ATPase is situated on either the inner or outer cell surface. The conducted research demonstrates the correctness of the first variant. Two monoclonal antibodies against the mentioned fragment of the α -subunit of pig Na⁺, K⁺-ATPase were found. The location of their epitopes was determined within the cell by the immunoenzyme assay method using intact and inverted cells (pig erythrocytes and embryonal kidney cells) as an antigen. By means of chemical modification and enzymatic splitting of the mentioned fragment the epitopes of

these monoclonal antibodies were determined in detail. Based on these data new models of the transmembrane organization of the COOH-terminus region of the Na⁺, K⁺-ATPase α -subunit are constructed. Figures 3; references 33: 11 Russian, 22 Western.

Modulation by Substrate: ATP Protein-Lipid Interactions in Firefly Luciferin-Luciferase System

957A0135B Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 11 No 6, Nov-Dec 94
(manuscript received 12 May 93) pp 614-619

[Article by A. F. Dukhovich, V. M. Morozov and N. N. Ugarova, Chemistry Faculty, Moscow State University imeni M. V. Lomonosov; UDC 577.158]

[FBIS Abstract] Firefly luciferase was adsorbed on nitrocellulose membranes coated by phosphatidylcholine with different concentrations of the substrates luciferin or ATP. The bioluminescence intensity of the adsorbed enzyme was measured. No influence of luciferin (0-50 μ M) on protein adsorption was detected. However, with an increase in ATP concentration the bioluminescence signal first is reduced by half, then increases to the limiting value, which is greater by a factor of 1.4 than the signal in the case of adsorption without ATP. This light change is attributable to the different quantities of the luciferase adsorbed on the membrane coated by phospholipid at different ATP concentrations. When the adsorption takes place in the presence of albumin there is no observable dependence of the light signal on the ATP concentration. ATP exerts no influence on protein adsorption on membranes which have not been coated with phosphatidylcholine. It is postulated that ATP has the capacity for modulating lipid-luciferase interactions and thereby change the affinity of the enzyme to the phospholipid bilayer. Since ATP is capable of modulating protein-lipid interactions in the firefly luciferin-luciferase system it accordingly is not only a substrate, but also a specific regulator of the structure, activity and stability of luciferase. It is not precluded that similar regulatory functions of ATP and other nucleotides also may be manifested for other ATP-dependent enzymes and proteins, especially in those cases when the biomolecules are included in membranes or are adsorbed on their surfaces. Figure 2; references 20: 8 Russian, 12 Western.

Permeability Induced in Artificial Membranes After Incorporation of ADP/ATP Antiporter From Bovine Heart Mitochondria

957A0135C Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 11 No 6 Nov-Dec 94
(manuscript received 28 Jul 93) pp 620-630

[Article by I. M. Tikhonova, A. Yu. Andreyev, Yu. N. Antonenko, A. D. Kaulen, A. Yu. Komrakov and V. P. Skulachev, Physicochemical Biology Scientific Research Institute imeni A. N. Belozerskiy; Moscow State University imeni M. V. Lomonosov; UDC 577.352.4]

[FBIS Abstract] The hypothesis with respect to the ability of the ADP/ATP antiporter to increase the conductance of phospholipid membranes (to function as an uncoupling protein), formulated in earlier studies by the authors, is examined in model systems with the incorporation of protein into artificial membranes. The proton conductance of the ANT-bacteriorhodopsin proteoliposome membrane was found to be an order of magnitude greater than that of bacteriorhodopsin. Only one Mersalyl treatment of ANT-bacteriorhodopsin proteoliposomes causes formation of high-conductance channel-like structures in the membrane. The principal features of this channel are similar to those of the multiple conductance channel of the inner mitochondrial membrane described by K. W. Kinnally, et al., J. BIOENERG. AND BIOMEMBR., Vol 21, pp 497-506, 1989. A high conductance of the single channel (2.2 nS) and its nonselectivity for K⁺, Na⁺, H⁺ and Cl⁻ indicate that hydrophilic pore formation occurred in the Mersalyl-treated membrane with reconstituted ANT. It is postulated that ANT may function as a permeability transition pore-forming protein in mitochondria. Figures 7; references 39: 5 Russian, 34 Western.

Langmuir Films of Ferrocene Carboxylic Acid and Glucose Oxidase Based on Amphiphilic Polyelectrolytes

957A0135D Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 11 No 6 Nov-Dec 94
(manuscript received 29 Jul 93) pp 639-646

[Article by A. V. Barmin, A. V. Yermenko and I. N. Kurochkin, AO All-Russian Science Center for Molecular Diagnostics and Therapy; UDC 577.3]

[FBIS Abstract] One of the promising directions in use of Langmuir technology is immobilization of biologically active substances in monomolecular films when creating biosensors. The authors developed a technology for forming Langmuir films of biologic macromolecules using synthetic amphiphilic polyelectrolytes. Such an immobilization of glucose oxidase and monoaminooxidase is capable of improving the catalytic properties of these enzymes and making possible their use in creating biosensors. When making use of oxidases in creating biosensors it is desirable to have a method for registry of the useful signal which is not dependent on the oxygen concentration in the medium. Langmuir films of ferrocene derivatives and glucose oxidase were formed on a graphite electrode by the Langmuir-Schaefer method using amphiphilic polyelectrolytes. Cyclic voltammograms of these films were used in studying the catalytic activity of the dissolved enzyme and immobilized enzyme jointly with electron transfer mediators. It was found that it is possible to conserve the mediator function of ferrocene carboxylic acid both with its adsorption on monomolecular films of polyelectrolytes and with the formation of Langmuir films from a mixture of the mediator and polyelectrolyte and with the adsorption of glucose oxidase on them. A linear dependence was found

for the amperometric response to glucose in the range of concentrations from 1 to 20 mM. By use of amphiphilic polyelectrolytes it is therefore possible to obtain catalytically active films of enzymes and electron transfer mediators. The ferrocene carboxylic acid immobilized in this procedure retains its mediator function with respect to the glucose oxidase enzyme and thereby the fundamental possibility is shown for direct interaction of the enzyme, mediator and electrode in multilayer films formed by means of Langmuir technology when using amphiphilic polyelectrolytes. Figures 5; references 22: 3 Russian, 19 Western.

Increase in Light-Collecting Capacity of Isolated Chloroplasts by Use of Lipid Derivatives of Rhodamines

957A0135E Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 11 No 6 Nov-Dec 94
(manuscript received 12 Apr 94) pp 660-663

[Article by V. I. Razinkov, Ye. M. Sorokin, G. S. Bobylev and Yul. G. Molotkovskiy, Bioorganic Chemistry Institute imeni M. M. Shemyakin and Yu. A. Ovchinnikov, Russian Academy of Sciences; Plant Physiology Institute imeni K. A. Timiryazev, Russian Academy of Sciences; UDC 576.311.342+577.336]

[FBIS Abstract] The photosynthesizing system of higher plants relatively poorly absorbs light in the yellow-green part of the spectrum where solar radiation is most intense. It was earlier demonstrated that an RhB-DG fluorescence probe, a lipophilic derivative of rhodamine B, introduced into isolated thylacoid membranes of chloroplasts, under conditions of nonsaturating illumination increases the intensity of the Hill reaction by 30 percent. The RhB-DG, whose absorption (λ_{max} 558 nm) partially fills the region of low absorption of the pigments of chloroplasts, conveys the absorbed energy to the reaction centers of photosystems 1 and 2 by the nonemissive resonance energy transfer mechanism, enhancing the light-collecting efficiency of the chloroplasts. This was demonstrated by both spectral methods, on the basis of the increase in the fluorescence of chlorophyll a in the presence of RhB-DG, and by measurements of the oxygen released in the Hill reaction. It is postulated that Rh101-O1 and Rh6G-O1, being more effective donors of energy for chlorophyll, also are capable of increasing the yield of photosynthesis products by about 30 percent. The lipophilic derivatives of rhodamines of three types (6G, B and 101) are fully adequate donors of excitation energy for the photosynthesizing system of plants and substantially increase its light-collecting capacity. Figures 3; references 3: 2 Russian, 1 Western.

Method for Measuring the Cholesterol Content of the Surface of Human Skin and Prospects for Its Use. I. Atherosclerosis

957A0137A Moscow KLINICHESKAYA
LABORATORNAYA DIAGNOSTIKA in Russian No 5
May 94 (manuscript received 15 Mar 94) pp 12-15

[Article by E.M. Khalilov, Ye. S. Fortinskaya, N.A. Nikitina, E.M. Kogan, and T.I. Torkhovskaya, Research

Institute of Physicochemical Medicine, Russian Federation Ministry of the Health and Medical Industry, Moscow]

[FBIS Abstract] A noninvasive screening test for cholesterol was developed based on the use of an ethyl alcohol-diethyl ether mixture (3:1 by volume) to extract from 1.5 to 1.6 μg of cholesterol per cm^2 of the clean palm skin surface. Review of previous literature indicates a parallel between disease of the aorta and the accumulation of cholesterol in the human skin. The level of cholesterol, triglycerides, and α -cholesterol of 20 healthy subjects and 92 atherosclerosis patients with different types of dyslipoproteinemias was determined. The healthy patients averaged 2.16 and the atherosclerosis patients averaged 3.04 $\mu\text{g}/\text{cm}^2$. This parameter did not correlate with the blood serum concentration of lipid components. A correlation was found between the cholesterol content of the skin surface and the dyslipoproteinemia coefficient representing the sum of (cholesterol + triglycerides) divided by the α -lipoprotein cholesterol. Figures 2; tables 3; references: 5 Russian, 13 Western.

Method for Measuring the Cholesterol Content of the Surface of Human Skin and Prospects for Its Use. 2. Psoriasis

957A0137B Moscow KLINICHESKAYA
LABORATORNAYA DIAGNOSTIKA in Russian No 5
May 94 (manuscript received 15 Mar 94) pp 15-17

[Article by Ye. S. Fortinskaya, T.I. Torkhovskaya, G. Ya. Sharapova, T.K. Loginova, and E.M. Khalilov, Research Institute of Physicochemical Medicine, Russian Federation Ministry of the Health and Medical Industry, Moscow]

[FBIS Abstract] A noninvasive method was used to study patients age 16-77 (average age 41) suffering from psoriasis from 7 to 25 years. Sixty-five had widespread psoriasis, 19 had psoriatic arthropathy, and 21 had psoriatic erythroderma. There were 21 healthy control subjects, age 22-54, without skin diseases. Lipids were extracted from the surface of the skin with a mixture of ethanol and ether (3:1) and were reported in $\mu\text{g}/\text{cm}^2$. The cholesterol content of the skin of psoriasis patients from both foci and externally healthy parts of the skin was considerably higher than in healthy controls. The total cholesterol content of the foci was higher than the norm by a factor of 2-4. The amount of cholesterol in the foci comprised 6.43, 7.89, and 11.13 $\mu\text{g}/\text{cm}^2$ in the case of widespread psoriasis, psoriatic arthropathy, and psoriatic erythroderma, respectively. The amount of both free and esterified cholesterol increased as the disease progressed in the foci. The greatest amount of nonesterified cholesterol was observed in the "healthy" skin of patients with the erythroderma serious form of psoriasis. The esterification coefficient—the ratio of esterified to total cholesterol—which is one of the markers of skin lipids in regard to atherosclerosis was determined and found to be greater in healthy subjects. The fact that free

cholesterol predominates in extracts of lipids obtained from the surface of foci of psoriasis patients may be explained by destruction of the epidermis; but this does not apply to the apparently healthy parts, which have no destruction of the epidermis. It can be assumed an elevated cholesterol content and disturbance of esterification are an indication of a concealed psoriatic process. Information on the pathogenesis and diagnostics of psoriasis, in which disturbance of lipid metabolism plays a definite role, can be obtained by this noninvasive method. Tables 2; references: 5 Russian, 8 Western.

Obtaining Monoclonal Antibodies To Human Respiratory Syncytial Virus

957A0143A Moscow VESTNIK ROSSIYSKOY AKADEMII MEDITSINSKIKH NAUK in Russian No 9 Sep 94 (manuscript received 19 Nov 93) pp 18-20

[Article by M.P. Samoylovich, L.P. Sukhubayevskaya, V.B. Klimovich, A.A. Sominina, Central Scientific Research Roentgenological-Radiological Institute, Ministry of Industrial Health and Medicine of Russia, Scientific Research Institute of Influenza, Russian Academy of Medical Sciences, St. Petersburg; UDC 615.371:578.83 1.31].012.6]

[FBIS Abstract] Monoclonal antibodies to respiratory syncytial virus (rsv), one of the most significant agents in acute human respiratory illness, were obtained. Purified rsv was used as an antigen to immunize mice and obtain a hybrid. The immunization process is described. Spleens from mice with the highest antibody levels were used. Culture liquid from hybrid cells and ascites fluid were used as a source of monoclonal antibodies. Antibodies were obtained which differed in epitopic specificity. One group reacted to purified virus antigens. A second bound mostly to unpurified virus antigens from culture fluid. Transfer of the monoclonal antibody into mice (in the form of ascites tumors) significantly increased their activity (hybridoma technology). The monoclonal antibodies developed here may be used for further study of the structural and functional organization of rsv and to construct diagnostic test systems. Figure 1; tables 2; references 6: 3 Russian, 3 Western.

Genetic Predisposition of Children with Blood Group B(III) to Latent Persistence of Group A Virus: A Possible Cause for the Origin of New Epidemic Strains in the Countries of Southeast Asia

957A0143B Moscow VESTNIK ROSSIYSKOY AKADEMII MEDITSINSKIKH NAUK in Russian No 9 Sep 94 (manuscript received 1 Nov 93) pp 21-24

[Article by A.A. Sominina, L.M. Tsybalova, L.S. Karpova, N.V. Lipina, I. Yu. Nikandrov, I.B. Semilutskaya, T.A. Bekhtereva, T.L. Popova, N.I. Konovalova, Ye. B. Grinbaum, I. Ye. Filippova, O.I. Kiselev, Scientific Research Institute of Influenza, Russian Academy of

Medical Sciences, St. Petersburg; UDC 616.98:578.832.1:578.53]-055.5/.7-053.2-092:612.118.221.2]-022.362-078.33]

[FBIS Abstract] The development of more sensitive and specific types of testing have provided new opportunities to study latent circulation of influenza virus. This paper presents the results of a three-year systematic study of 14-16-year-old healthy male students at a military school. They were examined periodically for the presence of viral antigens and to determine the state of humoral immunity to a number of influenza viruses. Influenza viruses were isolated and typed during outbreaks. Three outbreaks during the research period are described. The genetic predisposition of children to latent forms of influenza infection was studied. Testing of clinically healthy children for the presence of influenza antigens revealed that a hidden circulation of influenza A viruses could be detected in the children 2-4 months before the development of an epidemic. The frequency of asymptomatic forms of influenza in the pre-epidemic period varied from 10.3 percent to 20.9 percent. During the outbreak and directly thereafter, the frequency of asymptomatic persistence rose to 33-35.7 percent, decreasing to 3.5 percent in the post-epidemic period. The results indicate the constant presence in the human population of a definite dynamic group of individual carrying virus-specific antigens. This group is capable of sustaining an uninterrupted chain of epidemic events on a population level. In long-term virus carriers the predominant blood type was B(III) (60 percent). This blood group was found in only 17.4 percent of the remaining children. This blood group is most commonly found in Southeast Asia. It may be possible that children with blood type B(III) have a predisposition to long-term persistence of influenza virus A, which may explain why new epidemic strains arise in Southeast Asia, where this blood group is common. Figures 3; tables 2; references 15: 8 Russian, 7 Western.

On the Physiological Nature of Nystagmus

957A0146 Kiev ZHURNAL USHNYKH, NOSOVYKH I GORLOVYKH BOLEZNEY in Russian No 4 Jul-Aug 94 (manuscript received 21 Mar 94) pp 42-47

[Article by K.V. Gerasimov, V.R. Gofman, V.I. Usachev, V.A. Dubovik, Otorhinolaryngology Department, Military Medical Academy, St. Petersburg; UDC 616.28-008.4.14-021.2:612.881]

[FBIS Abstract] Vestibular nystagmus is a rhythmic vestibular-oculomotor reaction to stimulation of the ampullar section of the labyrinth. The eyes move rhythmically back and forth in fast and slow motion. The functional significance of nystagmus is stabilization of eye position when the head is moved such that stimulation of the semicircular canals cannot be compensated by eye movement alone. Nystagmus is a response to an asymmetric change in afferent flows from spectrally symmetrically semicircular canal receptors. The greater the asymmetry, the more acute the nystagmus. The

reason for the asymmetry is angular acceleration which acts on both labyrinths, however increasing afferent flow in one and decreasing it in the other. Development of the condition is described. Literature on the subject is summarized and found to be contradictory. The condition can last long after the stimulus is removed. The vestibular apparatus is seen as a feedback system for the statokinetic system. Nystagmus is a nonspecific, inadequate reaction of this system. Nystagmus can be generated by rotational, thermal, or electric stimulation of the labyrinth. References 22: 14 Russian, 8 Western.

Expression of Gene of Thermostable α -Amylase of *Bacillus licheniformis* Integrated in Chromosome of *Bacillus amyloliquefaciens*

957A0149A Moscow BIOTEKHNOLOGIYA in Russian
No 5 May 94 (manuscript received 28 Apr 94) pp 2-5

[Article by I.M. Freydkin, Yu.V. Yomantas and Yu.I. Kozlov, State Scientific Research Institute for Genetics and Selection of Industrial Microorganisms; UDC 577.218:577.151]

[FBIS Abstract] The creation of chromosomal systems for the expression of genes is a new promising research direction. The α -amylase of *B. licheniformis*, having a high thermal stability, and therefore attractive for commercial applications, was used in exemplifying this technique. The bacterial strains, plasmids, media and antibiotics used in this research are listed and pertinent DNA manipulations are described. The procedures used in producing, concentration and transduction of the E401 phage are outlined. The method for determining the activity of α -amylase is discussed. The construction of the vector for integrating the α -amylase of *B. licheniformis* and its introduction into *B. amyloliquefaciens* is explained in detail. The gene of thermostable α -amylase of *B. licheniformis* with the promoter and signal sequence of the *B. amyloliquefaciens* α -amylase gene was integrated into the *B. amyloliquefaciens* chromosome. The plasmid pE194cop6 with thermosensitive replication was used for this purpose. The integration frequency was 10^{-9} /cells \times generation. Mapping experiments demonstrated that the integration occurred at the locus of native *B. amyloliquefaciens* α -amylase. The integrated gene is stable in different generations under nonselective conditions. The level of synthesis of α -amylase in the integrant strains was close to that of the characteristic α -amylase in *B. amyloliquefaciens*. The thermostability of the α -amylase of the integrants was virtually as great as that of the native α -amylase of *B. licheniformis*. Figures 2; references 22: 4 Russian, 18 Western.

Expression of Cloned Genes of Bacterial Luminescence in Microorganisms Isolated From Laboratory Microcosms

957A0149B Moscow BIOTEKHNOLOGIYA in Russian
No 5 May 94 (manuscript received 20 May 94) pp 6-10

[Article by L.Yu. Popova, Ye.Ye. Maksimova, T.V. Repeta, A.V. Brilkov and N.S. Pechurkin, Biophysics

Institute, Siberian Department, Russian Academy of Sciences, Krasnoyarsk; UDC 577.218:57.083.121.3]

[FBIS Abstract] The genes of bacterial luminescence have been used in studying the propagation of genetically engineered strains in natural and model ecosystems. Bacterial luminescence makes it possible to study the expression of cloned genes of the Lux operon without recourse to determining activity of the luciferase enzyme in vitro. This line of research was pursued in a study of the dynamics of development of luminescence in *Escherichia coli* Z 905 bearing the recombinant plasmid pPHL 7 and in some other representatives of common bacterial microflora of laboratory microcosms that had captured bioluminescence genes. This microflora was identified as *Arthrobacter* sp., *Micrococcus* sp. and *Cyanobacteria* sp. The species of microorganisms with recombinant DNA formed colonies of the R and S types. The latter demonstrated a higher level of bioluminescence than did colonies of the R type. The dynamics of development of luminescence in bright clones of *Arthrobacter* sp. did not differ essentially from the dynamics of luminescence in *E. coli* Z 905 (pPHL 7). Some phenotypically dark colonies of *E. coli* and some natural microorganisms exhibited a low level of luminescence during cultivation in a liquid medium. The difference in expression of luminescence genes may be caused by significant differences in metabolism. The research suggests that the use of recombinant plasmids containing the pertinent genes of luminescent bacteria may be extremely convenient for predictive experiments making possible a reliable evaluation of genetically engineered strains introduced in different kinds of ecosystems. Figures 3; references 30: 16 Russian, 14 Western.

T4 Polynucleotide Kinase. III. Purification

957A0149C Moscow BIOTEKHNOLOGIYA in Russian
No 5 May 94 (manuscript received 28 Apr 94) pp 17-19

[Article by L. V. Vratskikh, O. A. Timofeyeva and V. I. Yamkovoy, Novosibirsk State University; UDC 577.152.61]

[FBIS Abstract] Since synthetic oligoribonucleotides are so highly valuable in different fields of molecular biology the authors have repeatedly published on their progress in optimizing the synthesis of oligoribonucleotides, most recently in BIOTEKHNOLOGIYA, No 4, pp 30-33, 1993. With respect to highly purified polynucleotide kinase, it was first obtained by Richardson and Panet. On the basis of modifications of their work the authors have now developed a simple method for obtaining adequate quantities of polynucleotide kinase (which is used in introducing phosphate, including radioactive phosphate, into RNA and DNA). The proposed method for producing adequate quantities of polynucleotide kinase suitable for oligoribonucleotide synthesis purposes does not involve a single chromatographic procedure. The first variant of the method was published in BIOTEKHNOLOGIYA, No 4, pp 50-53, 1991). A final

variant is now proposed. The steps involved are described: polynucleotide kinase purification, autolysis, fractionation with ammonium sulfate, fractionation on DEAE-Sephadex A-50 and fractionation of phosphocellulose P-II. T4 polynucleotide kinase was isolated from the biomass of *E. coli* infected with the T4 am N82 bacteriophage using fractionation with streptomycin, ammonium sulfate and on DEAE-Sephadex A-50 and phosphocellulose P-II. The enzyme yield was increased by a factor of ten in comparison with the precursor method described in the earlier study cited above (from 29,000 to 313,000 activity units from 200 g of biomass) and the content of the contaminating enzyme 3'-exonuclease was insignificant. The resulting preparation of polynucleotide kinase can be used for oligoribonucleotide phosphorylation. Figure 1; references 13: 8 Russian, 5 Western.

Effect of Structural Ordering on the Absorption Spectra of Langmuir-Blodgett Films of Vanadyl Phthalocyanine

957A0152 Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian No 1-2 Jul-Aug 94 (manuscript received 8 Dec 93) pp 19-27

[Article by Yu. P. Piryatinskiy, O. V. Yatsun, Institute of Physics of the Ukrainian Academy of Sciences, Kiev; UDC 535.373.2]

[FBIS Abstract] The absorption spectra and time-resolved fluorescence spectra of Langmuir-Blodgett (LB) films of vanadyl phthalocyanine (VOPc) are studied. The packing of X- and Y-type molecules in LB films is evaluated. In X-type films the VOPc planes of molecules are either at a small angle or parallel to each other and to the substrate. In Y-type films molecules in a bilayer form the conformation of dimers with serial and parallel orientation of the dipole moments. The structure of Y-type LB films causes strong absorption anisotropy, which can be seen in the dependence of the absorption spectra on the angle of incidence of light on the film plane. A change in the angle of incidence from normal incidence to 45° incidence leads to a relative decrease in absorption in the shortwave region of the spectrum and an increase in absorption in the longer wavelengths. Possible configurations of molecules (dipole moments) in the layer are proposed which may explain the absorption anisotropy. Specific features of the absorption spectra are discussed. The films have a low level of fluorescence for a short period of time. An equation describes the kinetics of fluorescence and the fluorescence spectra are presented. Possible electron states of VOPc films are discussed and illustrated. Figures 3; references 23: 13 Russian, 8 Western.

A New Polymorphism Within the Human Factor IX Gene That is Useful for Hemophilia B Carrier Detection

957A0175A Moscow GENETIKA in Russian Vol 30 No 6, Jun 94 pp 740-742

[Article by V. L. Surin, A. V. Lukyanenko, A. F. Tagiyev, and O. V. Smirnova; Hematological Research Center of

the Russian Academy of Medical Sciences, Moscow; submitted 25 Oct 93, revised and resubmitted 27 Jan 94; UDC 575:599.9]

[FBIS Abstract] A new *TaqI*-polymorphism in the *Alu*-repeat 4 within the intron *f* of the human factor IX gene was discovered. Direct sequencing of PCR-products containing a full-size factor IX *Alu*-repeat 4 was used to show that the *Taq-Alu4* polymorphism is associated with the C-T transition at the 72-bp *Alu*-repeat consensus sequence position. Amplified DNA fragments (15 pmols of AL7 and AL8 primers; 30 amplification cycles at 94°C for 1 min., 55°C for 1 min., and 72°C for 3 min.) were 492 bp long with two *TaqI* sites, one polymorphous and one constant, making it possible to control the degree of PCR-product hydrolysis during restriction analysis. Constant fragments are 308 bp long, polymorphous fragments 184 bp long. If the polymorphous site is present, the polymorphous fragment splits into two fragments, one 176 bp long, and the other 8 bp long. The encounter frequency of the *TaqI* polymorphous site, determined during testing of 152 unrelated X-chromosomes from individuals in the general Moscow population, is 0.20. The encounter frequency of heterozygotes with the *Taq-Alu4* polymorphism was 0.32 using the Hardy-Wineberg equation, in comparison with an experimental value of 0.33, which was obtained when studying 66 unrelated women from the general Moscow population. Low values for the coefficients of unequally balanced linkage and correlation show that the *Taq-Alu4* polymorphism was linked in equal balance to the *Taqd* polymorphism, while being somewhat less equally balanced in its linkage to the 50 bp insertion. Thus, the *Taq-Alu4* marker can be used in conjunction with *Taqd* polymorphisms and 50 bp insertion to detect Hemophilia B carriers and in the prenatal diagnosis of the disease. Figures 2, tables 2; references 9: 1 Russian, 8 Western.

Comparative Effectiveness of Preparations Used to Alleviate Primary Pathological Craving for Alcohol

957A0180A Moscow VOPROSY NARKOLOGII in Russian No 3 Jul-Sep 94 pp 20-23

[Article by A. G. Gofman, V. M. Kolodnyy, O. S. Sheveleva, Moscow]

[FBIS Abstract] There have been no reports in the literature on the use of substances specifically created to alleviate the primary pathological craving for alcohol, with the exception of imbecarb, which is produced in Russia. Various substances are used to support "remission" and prevent relapse. This paper compares the effectiveness of various pharmacological substances and a new agent, phosphabenzide, to treat patients with an acute primary pathological craving for alcohol. Phosphabenzide is a tranquilizer which has central H-choline and adrenolytic properties but no central M-cholinolytic activity (it does not inhibit cholinesterase). Phosphabenzide is compared with carbidine, imbecarb, nootropil,

amitriptylin, and mebicar. Phosphabenzide was found to be highly effective in eliminating or reducing craving, and was followed in level of effectiveness by carbidine and mebicar. Imecarb was not very effective. Phosphabenzide's effect on the psychological state of addicts was also examined. Those with alcohol fixation or in an apathetic state benefited most from phosphabenzide. Those with emotional disturbances derived less benefit. Ways of boosting effectiveness (using combinations of drugs) are described. Specific psychotropic drugs to be used for specific types of symptoms are described. Table 1; references 11 (Russian).

Immunochemical Study of the State of the Blood-Brain Barrier in Narcological Clinical Practice

957A0180B Moscow VOPROSY NARKOLOGII
in Russian No 3 Jul-Sep 94 pp 41-44

[Article by L. F. Panchenko, A. G. Vrublevskiy, Ye. A. Bryun, S. G. Morozov, O. S. Abramov, State Science Center of Narcology, Ministry of Industrial Health and Medicine of the Russian Federation]

[FBIS Abstract] Opiate and alcohol abuse can lead to damage in various membranes, including the blood-brain barrier. Membranes are made more permeable, in the case of the blood-brain barrier, allowing neurospecific proteins to reach the brain and cause damage. This paper seeks a neurospecific protein factor, the antibodies to which may play a significant role in damaging brain tissue in addicts when the structure of the blood-brain barrier is damaged. This paper also examines how this factor may be used to determine the functional state of the blood-brain barrier in narcological clinical practice. An antibody titer to components of human brain extract was found to be higher in the experimental group than in the control. Research was done to identify the neurospecific antigen that is one of the targets of autoimmune aggression in opiate addiction. The protein, which was found in electrophoretic analysis, was previously undescribed and is yet unidentified. Amino acid sequencing is planned. In the control group, the protein level did not exceed 4 ng/ml in the blood serum. In other tissues it was less than 1.5-3 ng/g, and in the brain, it was 3+/-1.8 µg/g. In addicts the blood serum level ranged from 3 to 10 ng/ml. The level of this protein may serve as an indicator of blood-brain barrier integrity. High levels were found in patients with acute alcoholic encephalopathy and opiate addiction. Figure 1; table s 2; references 8: 4 Russian, 4 Western.

Fluorescent Monitoring of Solid-Phase Peptide Synthesis With a Quartz Reactor Cuvette

957A0235A Moscow BIOORGANICHESKAYA
KHIMIYA in Russian Vol 20 No 6 Jun 94 (manuscript
received 12 Oct 93) pp 635-643

[Article by V. N. Medvedkin, Ye. A. Permyakov, V. N. Uverskiy, A. F. Gripas, Yu. V. Mitin, Institute of Proteins, Russian Academy of Sciences, Pushchino,

Institute of Theoretical and Experimental Biophysics, Russian Academy of Sciences, Pushchino; UDC 577.112.6:542.95:543.426]

[FBIS Abstract] A quartz reactor cuvette is used to measure fluorescence spectra directly on the polymer support during solid-state peptide synthesis. The method is nondestructive and noninvasive. The reactor is described. Any standard fluorimeter can be used with the reactor. An important advantage of fluorescent monitoring of solid-state peptide synthesis is its insensitivity to strong scattering of the polymer matrix, which makes it possible to obtain information on processes occurring directly on the polymer. The capabilities of the device are demonstrated using the example of the fluorescence of the Fmoc group (9-fluorenylmethoxycarbonyl) in solution and on a polymer support. The effects of concentration quenching of fluorescence is studied. The sensitivity of the fluorescence monitoring method is more than sufficient to obtain useful information. Figures 6; references 43: 2 Russian, 41 Western.

Cloning of cDNA Encoding Human Ribosomal Protein S26 and Determination of Its Primary Structure

957A0235B Moscow BIOORGANICHESKAYA
KHIMIYA in Russian Vol 20 No 6 Jun 94 (manuscript
received 10 Jun 93; after revision 27 Sep 93) pp 644-649

[Article by M. L. Filipenko, S. N. Vladimirov, A. I. Muravlev, G. G. Karpova, N. P. Mervetsov, Novosibirsk Institute of Bioorganic Chemistry, Siberian Division, Russian Academy of Sciences; UDC 577.212.3;577.217.343'112]

[FBIS Abstract] Using the known primary structure of the mRNA of rat ribosomal protein 26, two deoxyribonucleotides were selected as primers for amplification of human cDNA protein S26. The specific cDNA obtained using the polymerase chain reaction method is cloned in a plasmid vector and sequenced. Its primary structure is determined. Comparative analysis has shown that the cDNA of human ribosomal protein S26 has a high degree of homology (87.7%) with the cDNA of rat ribosomal protein S26. The only amino acid residue replacement is detected at position 38, Ser → Val. Results of blot hybridization of partially digested amplified cDNA with hydrolyzates of human genome DNA are the basis for the statement that there are no fewer than seven copies of the gene for ribosomal protein S26. The method does not permit determination of the total primary structure of the mRNA, but it substantially simplifies cloning of the cDNA of ribosomal proteins. Figures 3; references 12: 1 Russian, 11 Western.

Interaction Mechanisms of Phenylbenzimidazole and Phenylindole Dyes With DNA

957A0235C Moscow BIOORGANICHESKAYA
KHIMIYA in Russian Vol 20 No 6 Jun 94 (manuscript
received 24 Dec 92; after revision 10 Jan 94) pp 650-668

[Article by V. S. Sibirtsev, A. V. Garabadzhiu, S. D. Ivanov, Central Scientific Research Institute of Roentgenology and Radiology, Russian Academy of Medical

Sciences, St. Petersburg, St. Petersburg Technological Institute; UDC 547.785.5'55.1'963.32:535.33/34]

[FBIS Abstract] DNA interaction with phenylbenzoimidazole and phenylindole dyes is studied using their absorption spectra, luminescent excitation spectra, and emission spectra in aqueous media of varied composition. The relative contribution of electrostatic forces and hydrogen bonds in this interaction are determined. The effect of the microenvironment on illumination of potentially active luminophores was studied using the spectral properties of pure dyes in isopropanol. The parameters of the medium are very important when using the dye as a DNA fluorophore. For any dye-substrate system there is an optimal range of temperature and pH values. The medium's permittivity and ionic strength are important. Optimal values of these parameters must be selected for each specific DNA-dye system. Spectral data were used to calculate parameters for complex-forming compounds. Relations between various complex-forming and spectral parameters are presented. Terminal electron donor and acceptor groupings are proposed for targeted synthesis of new fluorophores in DNA. Requirements are formulated for their use for various classes of compounds. Figures 11; table 1; references 31: 15 Russian, 16 Western.

Antisense Oligonucleotides Containing 1-(β -D-2'-deoxy-threo-pentofuranosyl) Thymine at the 3' and 5' Ends

957A0235D Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 20 No 6 Jun 94 (manuscript received 2 Jul 93) pp 669-675

[Article by Ye. A. Romanova, V. N. Tashlitskiy, T. S. Oretskaya, I. Sokolova, Z. A. Shabarova, Chemistry Department, A. N. Belozerskiy Scientific Research Institute of Physico-Chemical Biology at Lomonosov Moscow State University; UDC 547.963.32.057:542.95]

[FBIS Abstract] An automated phosphoramidite method was used to obtain 12-14-meric oligonucleotides containing xylo-thymidine (xT), which differs from natural thymidine in inverted configuration at the C3' atom. The introduction of xT residue at the 3' and 5' ends of the oligonucleotides slowed their hydrolysis by snake venom phosphodiesterase and by blood serum enzymes, did not hinder the formation of other duplexes with complementary target regions, and had no substantial thermodynamic destabilizing effect. The introduction of two successive xT units at the 3' end of the oligomer substantially increased the oligomer's nuclease resistance. The resultant modified oligonucleotides form stable duplexes with complementary DNA and RNA matrices. The use of modified probes has practically no effect on the effectiveness of RNA hydrolysis catalyzed by RNAase H. Oligonucleotides with these terminal modifications may be considered a new class of antisense oligomers. Figure 1; tables 3; references 12: 5 Russian, 7 Western.

Highly-Effective Subtractive Hybridization of cDNA

957A0235E Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 20 No 6 Jun 94 (manuscript received 27 Jan 94) pp 701-704

[Article by S. A. Lukyanov, N. G. Gurskaya, K. A. Lukyanov, V. S. Tarabykin, Ye. D. Sverdlov; M. M. Shemyakin, Yu. A. Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Moscow; UDC 577.215.037]

[FBIS Abstract] Subtractive hybridization of cDNA is widely used, but not for identification of transcripts with a low abundance (1-10 molecules). The multi-step subtractive hybridization method used here permits 500-1000-fold enrichment of low-abundance cDNA. In the first round, the nonhybridized single-stranded fraction of the tracer is separated for repeated subtraction with a driver in the second round. The initial mixture of varied cDNAs in the single-stranded portion of the tracer is normalized after the first round. Normalization increases the probability of detecting rare transcripts in cDNA libraries obtained in hybridization. Specially constructed primers are used to amplify the single-stranded fraction of the tracer after subtraction. A trapper removes the double-stranded cDNA fraction formed in the first round. Polymerase chain reaction amplification is then performed (20-25 cycles). Amplification selectively increases the concentration of those tracer molecules which remained single stranded after the first round of subtraction. The method is simple, and separation of the tracer, driver, and resultant hybrids is unnecessary. Figures 2; references 6: 2 Russian, 4 Western.

Scientific and Technical Support to Biological Enterprises

957A0242A Moscow VETERINARIYA in Russian No 12, Dec 94 pp 3-5

[Article by A. Ya. Samuilenko, All-Russian Scientific Research and Technological Institute of Biological Industry: "Scientific and Technical Support to Biological Enterprises"]

[FBIS Translated Text] The agrobiological industry of the Russian Federation is represented by 14 biological enterprises and two scientific research institutes (VNITIBP [All-Russian Scientific Research and Technological Institute of Biological Industry] and VNIIZh [All-Russian Scientific Research Institute of Agriculture and Livestock Breeding]), which have joined together to form the Rosagrobioprom AO [joint stock company]. The enterprises of the industry produce over 170 agents, including: antibacterial vaccines, 30; antiviral vaccines, 46; multivalent vaccines, 8; diagnostic drugs, 44; therapeutic sera and globulins 15; bacteriophages, anatoxins, solutions, and other preparations 29. To a large extent, these products meet the current demands of livestock

breeding, although there is a need for an increased output of medical sera and immunoglobulins: currently only 60% of the demand for these products is met by the industry.

The production of biological agents is carried out under a strict observance of the protective/quarantine and veterinary/sanitary conditions and ecological requirements.

In order to keep the large number of material-producing source animals (from 5000 to 20,000 head) and to provide them with feed, the biological enterprises have auxiliary farms of their own with the necessary lands and pastures.

Industrial production of biological agents involves the consumption of a large amount of heat, electric power, demineralized water, and sterile air and the use of source animals, various raw materials, food products (eggs, beef, milk), culture media, chemicals, etc.

The existing industrial base and the equipment standards of the enterprises are obsolete and fall short of the modern international standards for industrial technologies.

The basic production stock of the enterprises (over 300 equipment units) consists of a large number of collector vessels, settling tanks, biological reactors, autoclaves, as well as centrifuges, separators, filtering, refrigerating, and drying plants and all kinds of production lines for dispensing, packing, and sealing of the agents, as well as testing and metering devices.

Of the total production equipment resources possessed by the enterprises of the agrobiological industry (approximately 4500 items), only 7 percent are modern and meet world standards. For the most part, these are imported hardware units. However, in the past 15 years even this hardware was not upgraded and or supplied with spare parts, so it too is subject to write-offs.

No specialized equipment for biological industry is manufactured in the country. Instead, this industry utilizes equipment produced in other sectors: chemical, food, and medical industries. However, because of the physical wear (it has been in operation for over 10 years) this hardware must also be replaced in the next few years. This production stock at biological enterprises accounts for some 45 percent of all of their plant. Most units fall short of modern technological requirements and purposes and for this reason could not be used in the future.

The average mechanization level of basic and auxiliary operations is 52 percent, with a maximum level of 65 percent and minimum 35 percent. The automation level is 29 percent and 8 percent, respectively.

The low level of equipment availability at the biological enterprises is a factor holding back the effort to improve and introduce new technologies for production of biological agents that have been developed by scientific research institutes.

As a result, the technological level of enterprises in the agrobiological industry suffices at present only to produce biological agents by conventional processes created during the past decades. Although the agents they produce are not inferior to and sometimes, in fact, exceed their foreign analogues by their biological activity, the technological backwardness of the production results in a higher cost, especially in the preparatory stage and in the manufacturing of final forms. As a result, the agents contain all kinds of ballast, nonspecific proteins, adjuvant and depositing substances, and other admixtures, noxious to the animal body but introduced to attain a high immune response.

Improvement of existing technologies and the quality of bioagents and the production by the industry of new and effective product items can only be accomplished if a technological retooling of enterprises takes place, including the introduction of equipment expressly designed for biological industry. This is the urgent task facing today the agrobiological sector.

Given the existing difficulties in the organization and execution of preventive and anti-epizootic efforts and an industrial-scale production of the means for prevention, diagnosis, and treatment of animal diseases, the Council of Ministers—Government of the Russian Federation passed in 1993 the edict "On the Measures Toward Development of Agrobiological Industry and Strengthening of the Material/Technical Base of the Veterinary Service." In implementation of this decree, a Federal Target Program "Development of Agrobiological Industry of Russia for the Period up to the Year 2000" was formulated. The program calls for a set of interconnected activities, which include scientific support to the development of the industry, technological retooling and modernization of existing enterprises according to the international standards, development of technologically related production lines, and production of biological agents based on forecasts of the epizootic situation.

The implementation of these plans is dictated by analysis of the current status of the agrobiological sector, the product quality, predictive/analytic studies of the world and domestic markets, international standards for biological production, scientific research in technology and equipment for the manufacturing of biological agents, and overall research trends in this sphere.

Scientific research and design and development work (R&D) in biotechnology will be based on the following principles:

- improvement of industrial technologies for manufacturing of veterinary biological agents, so as to improve their sensitivity and protective strength: diagnostic agents to 95-100 percent, live vaccines to 90-95 percent, and dead vaccines to 85-90 percent;
- creation of new means for diagnosis and prevention of especially dangerous and less-studied animal diseases

that have not been recorded previously by using modern biotechnological methods;

- development and introduction into industry of experimental production plants, special biological reactors, and universal production lines to organize automated and highly effective flexible (multi-profile) production facilities at the enterprises in the industry;
- improvement of existing and creation of essentially innovative systems to raise the environmental safety of the biological industry and the reliability and efficacy of operation of treatment facilities, providing a possibility for reprocessing of wastes into useful products;
- forecasting and formulating the basic principles of long-term planning and distribution of biological production based on epizootic surveys and marketing studies;
- creation and introduction of modern information/computer systems for optimal marketing, development, and optimization of industrial processes and management, as well as quality assurance and monitoring of the flow of raw material resources.

For the implementation of the scientific research tasks posed by the Federal Target Program, the VNITIBP launched an R&D project "Creation of flexible, mechanized, and automated lines and technologies for technological and process-engineering modernization of biological enterprises in the agroindustrial complex." This project has been incorporated in the GNTP [State Scientific and Technical Program] entitled "Promising Processes for Farm Production," subprogram "Agricultural Biotechnology." The program was approved for implementation in 1993 and is financed by the Ministry of Science and Technical Policy of Russia (the Department of Scientific and Technological Progress in the Agrarian-Industrial Complex); it is supported by federal budget allocations for research, and partially, by contracts with customers.

The main goal of this project is to accomplish technological retooling of agroindustrial enterprises which manufacture biological means for protection of animals and plants based on development of new kinds of industrial equipment and modern biotechnologies.

The project calls for a large-scale development of modern universal broad-nomenclature production lines organized according to the modular/aggregate principle, which makes it possible to produce a broad spectrum of biological agents for veterinary, livestock breeding, and plant growing needs; plans for rational placement of industrial enterprises (including small plants) in parts of the country located close to the areas where the products are to be used, and a specialized system for product quality assurance according to international standards. The implementation of this project will not only promote process-engineering modernization and retooling of biological enterprises, but also include arrangements for product certification.

The project calls for cooperation of over 20 institutes and organizations of various profiles. For the development of new vaccines and drugs for infectious diseases of animals and technologies of their production, the main project participants are VNITIBP, VNIIZZh, VIEV [All-Russian Institute of Experimental Veterinary Science]; VGNKI [not further expanded]; VNIIFBP [All-Russian Scientific Research Institute of Physiology and Biochemistry of Farm Animals]; for microbiological means of plant protection and highly effective plant growth stimulants, the participants are VIZR [All-Russian Scientific Research Institute of Plant Protection]; VNIISKHM [All-Union Scientific Research Institute of Agricultural Machine Building]; the Biomash NPO [Scientific Research Association]; VNIISB [All-Russian Scientific Research Institute of Agricultural Biology]; and NIISZR [Scientific Research Institute of Plant Protection Means]. For development of new kinds of equipment and means of mechanization and automation of technological processes, the participants are VNITIBP, the Biomash NPO, the Biopribor NPO, and Internauka AO. The industrial-scale production of equipment will be organized at special enterprises: the Biomashstroyeniya [biological machine building] factories and certain defense enterprises within the framework of the military-to-civilian conversion.

The project is scheduled for seven years. During the first three to four years, all scientific research work must be completed and the experimental production of biological agents according to new processes should be developed. In the subsequent three years, the technological infrastructure will be created and an industrial-scale manufacturing of new equipment and components for the production lines will begin.

The technological retooling of biological enterprises based on modern equipment and flexible production lines will allow these enterprises to introduce new, environmentally safe and productive biological technologies and improve the quality of their products.

The Federal Target Program for the development of agrobiological industry includes also plans for development and introduction of new means and methods of diagnosis and prevention of infectious diseases of animals based on modern biotechnology and specialized quality assurance system. Covering a period of four years, this program calls for introduction of new product items by biological enterprises. These products, developed by various scientific research organizations, include mono-, poly-, and associated vaccines, immuno assays, polyvalent medicinal sera and immunoglobulins, new nutrients, and other materials and components for industrial biotechnology and processing of biological production waste. A large section of the program is concerned with development of an industry-wide system for assurance and control of the quality of bioagents and a computer information network for the agrobiological sector.

The implementation of the set of measures for the scientific research support to the federal program, if financed from the federal budget, will be conducive to a stable development of the agrobiological industry in the new economic environment and enable it to attain world standards in the manufacturing of high-quality and competitive veterinary biological agents.

A System for Fighting Cattle Leucosis and Its Implementation in a Rayon

957A0242B Moscow VETERINARIYA in Russian
No 12, Dec 95 pp 6-9

[Article by V. K. Dvoynikov and P. N. Smirnov, Institute of Experimental Veterinary Science of Siberia and the Far East: "A System for Fighting Cattle Leucosis and Its Implementation in a Rayon," printed under the rubric "Practice, Experience, Problems, Prospects"]

[FBIS Translated Text] The agrarian sector of the Shushenskiy Rayon of the Krasnoyarskiy Krai is comprised of five joint stock companies, one state farm vocational school, a poultry factory, and over 200 individual farms. The enterprises have a total of close to 35,000 head of cattle. Specifically, 16 farms have 8,000 cows; 4 farms with 1000 head of cattle each (complex farms); 2 farms with 800 head (complex farms); 6 farms of 400 head each (complex farms); and 4 farms with 200 head each.

The area breeds mainly (97 percent) black-mottle cattle. Since 1979, Holstein-Phrisian bulls were used according to a breeding plan. The mean milk yield per cow in the rayon in 1991 was 3895 kg, and in 1993, 3400 kg.

Based on the studies by V. M. Nakhmanson (1988), P. N. Smirnov and co-authors (199), G. A. Simonyan and

co-authors (1993), and others, and taking into account the peculiarities of the farms in the Shushenskiy Rayon, we concluded that the relatively high level of viral leucosis of cattle (VLC) (25.3 percent, and in individual cases up to 50 percent) was due primarily to the importation of a large number of pedigree cattle from the Leningrad region and other northwestern areas of the former USSR, the continued unfavorable status of the herds in terms of leucosis prevalence, a high concentration of the herds (from 400 to 1000 animals) on a relatively small territory, the overstay of hematologically sick animals and the common calving sections (for sero-negative and sero-positive herds), the feeding of the calves with unprocessed pooled milk, and a low level of technological monitoring.

Until 1990, the organization of the effort to improve the health of cattle in terms of leucosis prevalence at the farms of the Shushenskiy Rayon was conducted carefully, but with no effect. It was mainly concerned with scheduled diagnostic investigations and the sorting-out of hematologically affected leucosis-bearing animals.

Instructions on the efforts to fight leucosis in cattle, approved in 1989 and currently in effect, made it necessary to organize the effort on a systemic level under the state veterinary inspection. Scientists on staff of the IEV [Institute of Experimental Veterinary Science of Siberia and the Far East] in a joint effort with the local veterinary services worked out a comprehensive program (a system) for improving the health of the cattle on the farms of Shushenskiy rayon in terms of leucosis incidence. The program consisted of three main elements (see the table).

Heard Health Improvement System on Farms of Shushenskiy Rayon to Eliminate Cattle Leucosis

Basic Units		
Veterinary	Scientific/Methodological	Organization/Management
1. Diagnostic study of cattle 6 months and older for VLC infection.	1. Epizootic situation analysis.	1. Isolation of sero-positive animals from the common herd within 4-5 days.
2. Hematologic study of adult sero-positive cattle for leucosis.	2. Health improvement plans for herds with the choice of optimal variant.	2. Branding of RIA (+) animals.
3. Veterinary treatment of animals according to established common procedure: starting with RIA (-) and ending with RIA (+).	3. Use of highly sensitive methods of VLC infection diagnostics.	3. Pasteurization of pooled milk for feeding of cows since 10-day age or use of milk from RIA (-) herds.
	4. Training courses for serologists/hematologists/veterinarians.	4. Separate calving sections for RIA (+) and RIA (-) cows and heifers.
	5. Training course for veterinarians in organization and management of the herd health improvement effort.	5. Periodic (at least once every 6 months) working conferences at top management level (reporting the results of the health improvement effort).

From the outset, the system called for an operative principle that required that any finding obtained by the veterinary lab be followed by a specific intervention. For instance, when, based on the results of a serologic

investigation (RIA) of heifers at six months, it was found that 2 percent of them were sero-positive, within 4-5 days these animals were transferred at the farms into the fattening stock group.

In 1991, based on diagnostic studies (RIA) for each farm, specific programs of health improvement effort were formulated. The choice of an alternative for this effort depended on the leucosis virus infection level in the herd, as well as on the livestock breeding processes, and the economics of the farm concerned.

Under the current instructions, three variants (schemes) of health improvement were utilized with respect to cattle leucosis.

The first variant adopted for two farms (Subbotinskoye, with milk herd infection prevalence 12 percent, and Kolos, with infection prevalence 14.9 percent) called for dividing the herd into two groups: sero-negative and sero-positive.

For the second (sero-positive) group, separate barns with a separate pasture area were organized. For 15 days after herd separation, all the animals were studied hematologically. The sick animals were sorted out (based on a single investigation). The study was repeated every 6 months.

The animals of the sero-negative group were investigated by RIA every 3-4 months until two negative results for the herd were obtained. The animals which yielded a positive response (after each study of the sero-negative group) were transferred to the sero-positive group within 4-5 days.

The sero-negative group was replenished with negative-response heifers, which were added to the basic herd in groups and assigned to individual milkers. The second variant was practiced for two farms (Rossiya and the state farm vocational school). The former had an infection prevalence of its milk herd at the level of 23.8 percent, the latter 43.0 percent. This variant did not include herd separation.

After the first study of cows and heifers with RIA on agar that contained VLC antigen, all sero-positive animals were subjected to a hematologic study (which was repeated every 6 months). Sick animals were sorted out for slaughter after obtaining two positive hematologic results with a spacing of 2-3 months. The positive-testing animals were isolated after the first study.

The attention was focussed on raising a replacement herd that would be free of leucosis infection. For this purpose, sero-negative heifers were added to the general herd, which had been tested at 6, 12, and 18 months, as well as before the introduction. The replenishment was conducted by groups of 100 herds, and the milkers for each group were specially assigned.

The serological monitoring of the animals of the sero-negative group was done every 3-4 months. The positive-testing animals were identified and branded with liquid nitrogen. As groups of "clean" replacement animals were formed, they were used to replenish the number of sero-positive cows that were transferred to a different farm.

The third variant of health improvement was formulated to accommodate the specifics of two farms: Sibir (31.6 percent of VLC-infected cows) and Niva (20.5 percent). This was a combination of the first two variants: small farms (200 cows each) were treated with the herd-separation method, while the larger farms (complexes) were organized with replacement of sero-positive animals by groups of separately raised sero-negative heifers.

The general principle adapted at all farms (at the management level) required that all sero-positive heifers (of any age) be isolated and raised on separate sites and then, after attaining the proper weight, be sent to the slaughterhouse. As an exception, insemination of such heifers was sometimes allowed with the purpose of subsequent replenishment of the sero-positive cow herd. This was practiced in the early stage of the health improvement program at such farms.

The targeted, science-based health improvement effort on the farms in this area was started on 1 July 1991. The results described in the present paper are current as of 31 December 1993.

In the first variant, after the division of the herds into sero-negative and sero-positive groups, the "clean" herds 6 months were found to contain another 5.1 percent and 5.8 percent of VLC infected animals. Subsequently, the number of sero-positive animals on both farms declined and based on the autumn 1993 data, the infection prevalence in "clean" herds was 1.0 percent and 0.6 percent at Subbotinskoye and Kolos, respectively.

The health improvement dynamic was somewhat different at the state farm vocational school and the Rossiya joint stock company (second variant). In the former, the primary study identified 43.0 percent of sero-positive cows. The second study of the sero-negative ("clean") group found another 22.4 percent of VLC-infected animals. It was not before 1992 that any significant reduction of the infection prevalence was achieved on these farms (down to 3.8 percent); by 1993 it dropped further to 1.9 percent.

On the Rossiya farm, the sero-positive cows were replaced by groups of "clean" heifers (50-100 head to a group), which were bread in isolation under regular serologic monitoring (every 6 months) for leucosis infection. By late 1992 the sero-negative milk herd contained just 1.5 percent of VLC-infected animals. These were placed in a separate barn and the serologic monitoring was continued.

At the latest count (fall 1993) the herds still contained 0.7 percent of sero-positive animals, but in January of 1994, the RIA study of this herd found a very small number of infected cows: just 5 sero-positive out of 586.

The dynamics of the herd health improvement at the farms according to the third (combination) variant was also noteworthy. The infection prevalence data during the program at the Sibir and Niva farms were virtually similar to those observed with the first variant (herd separation). After the second study the Niva farm still

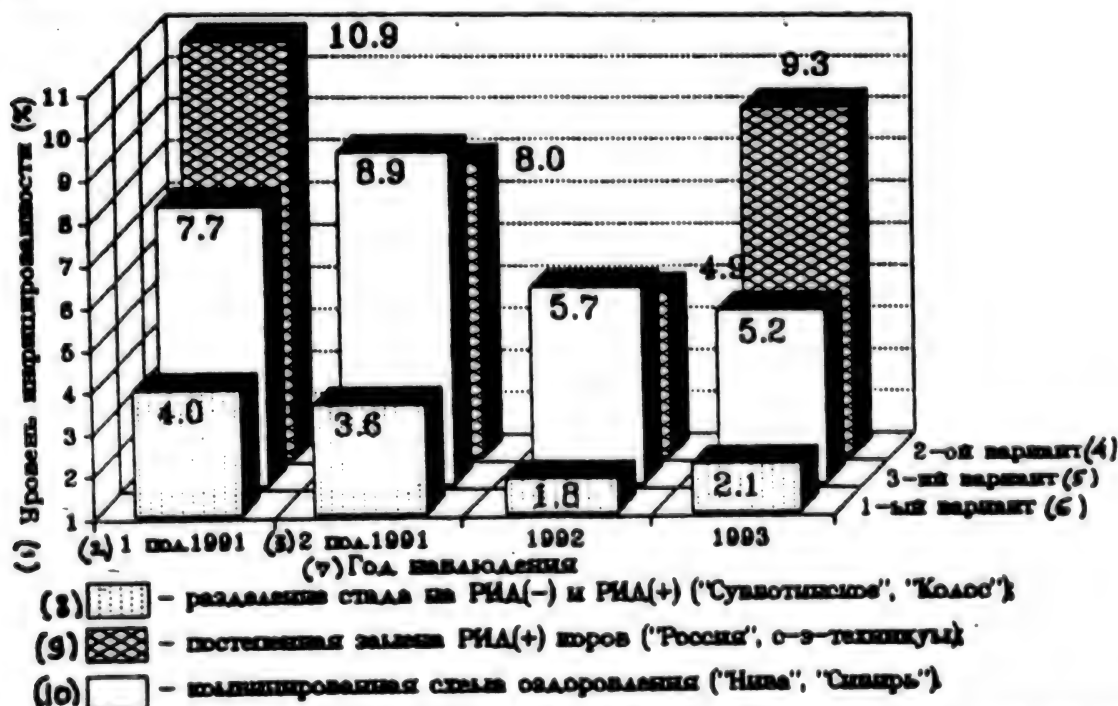
had 6.2 percent of sero-positive cows in the "clean" herds. By the next study their number was reduced by half, and by the late 1993 they were just 1.4 percent of infected animals. In the second farm (Sibir) a similar pattern was observed, and by the late 1993 they made up just 2.2 percent of infected animals.

The analysis of the health improvement dynamics of the herds with the three variants showed that all the methods could be used effectively. Within 2.5 years, we attained a rate of health improvement where the "clean" (sero-negative) herds contained 1-2 percent of VLC-infected cows. However, this is only the phenomenological aspect of the problem, while the economic aspect should also be considered. In analyzing the health improvement dynamics of sero-positive heifers (for all ages) on all farms, we found that with agar gel RIA the first study of heifers aged 6 months failed to reveal a considerable number of infected animals. This was confirmed by the relatively high infection incidence in heifers of an older age (12 and 18 months): from 1.7 to 11.4 percent. Obviously, in this case some of the animals were the virus "incubators," i.e., they were virus carriers, but did not have the sufficient titer of antibodies established by agar gel RIA.

The figure gives average data of infection incidence in heifers aged 12 months from farms which adapted the three variants of health improvement programs. It shows that the smallest number of sero-positive heifers in this age in "clean" herds were found when the milk herds were separated into sero-positive or sero-negative groups: within 2-4 percent (depending on the number of investigations). On the other hand, with the gradual replenishment (the second variant), the proportion of sero-positive animals was considerably higher: from 5 percent to 9 percent. In the last investigation (1993) it still remained high: 9.3 percent. The combination method occupies the intermediate position between the other two variants (5.2-5.7 percent of sero-positive heifers in the last two studies).

A similar trend was observed in heifers of the mating age.

All the variants of leucosis elimination yielded positive results. The epizootic situation in terms of the VLC infection in the six agricultural enterprises 2.5 years into the health improvement effort was characterized by a few single cases of sero-positive (RIA) animals. The economic advantages of complete separation into the sero-positive and sero-negative groups over other techniques was demonstrated.



Infection incidence dynamic in 12-month-old heifers on farms of the Shushenskiy Rayon with different herd health improvement variants.

Key: (1) Infection incidence level (%) (2) 1991, first half (3) 1991, second half (4) variant 2 (5) variant 3 (6) variant 1 (7) Observation year (8) Separation of herd into RIA (-) and RIA (+) animals (Subbotinskoye, Kolos) (9) Replacement of RIA (+) cows (Rossiya farm, state farm vocational school) (10) Combination variant (Niva, Sibir).

Pathogenetically, the results are explained by the fact that we bring down to a minimum the infection of heifers in prenatal and early postnatal development periods. While at this point we lack objective knowledge on the variation of VLC biology (the virulence and pathogenicity) in the milk herds with different infection levels as a function of the number of carrier passages, we can offer a hypothetical explanation of this phenomenon. In all likelihood, a portion of sero-positive cows capable of transmitting VLC to calves by transplacental pathway is greatly increased in such conditions.

One cannot exclude also a possible immunologic defect formed in VLC-infected calves in the postnatal period (up to 6 months) as a result of intense vaccination (up to 6-8 vaccinations) within a relatively brief time. The likelihood of immune depression in such conditions is high, and against this background the so-called fall-out of RIA (during the first study at 6 months) could be a natural result.

These hypotheses deserve a special investigation.

Some Plasma Markers of Vascular Endothelium Damage in Patients With Hemorrhagic Fever With Renal Syndrome

957A0251 Moscow *GEMATOLOGIYA I TRANSFUZIOLOGIYA* in Russian Vol 39 No 5 Sep-Oct 94 (manuscript received 19 Jan 94) pp 41-42

[Article by I. M. Davidovich, T. A. Parshina, Khabarov State Medical Institute]

[FBIS Abstract] Hemorrhagic fever with renal syndrome can inflict serious damage on many organs and systems and may cause life-threatening complications. The pathogenesis of this disease is damage to small vessels, which leads to an increase in their permeability, disruptions in the blood coagulation system, and the development of acute renal inadequacy. Previous findings are summarized. This paper discusses the state of vascular endothelium when this disease is present and studies the presence of three markers, the Willebrand factor, antithrombin III, and 5'-nucleotidase, which can be used to determine the functional state and damage to the vascular endothelium. Blood samples were taken from patients with severe and moderately severe forms of the disease during different stages of the disease. The Willebrand factor increased by a factor of two in the oliguria stage. In the polyuria stage the Willebrand factor began to fall but remained clearly higher than in the control group. In the convalescence stage the level normalized, although individual patients with a severe form of the disease had levels exceeding the control. Antithrombin III levels on average did not differ from the control in any stage of the disease. Levels of 5'-nucleotidase in the blood serum exhibited the largest changes. In the oliguria stage the level exceeded the control by almost a factor of nine. In the polyuria stage it remained at the same level. The convalescence stage was characterized by a significant drop (by more than a factor of two) in the level of this marker, although it remained significantly

higher than the control. The clear correlation with the clinical manifestations of hemorrhagic fever makes it possible to use the markers to predict the risk of development of dangerous hemorrhages in these patients. The accuracy of prediction is 63.6%. Table 1; references 11 (Russian).

Effect of Implantation of Cloned Human Gene apoA1 on the Development of Hypercholesterolemia in Rabbits

957A0253 Kiev *BIOPOLIMERY I KLETKA* in Russian Vol 10 No 6 Nov-Dec 94 (manuscript received 20 Jul 94) pp 98-105

[Article by V.V. Frolkis, V.A. Kordyum, S.N. Novikova, L.N. Bogatskaya, D. V. Irodov, L.I. Likhacheva, R.I. Potapenko, T.G. Mezzhukhina, M.K. Bitner, Institute of Gerontology, Academy of Medical Sciences of Ukraine, Kiev; Institute of Molecular Biology and Genetics, National Academy of Sciences of Ukraine, Kiev; UDC 577.21]

[FBIS Abstract] This paper examines the effect of implantation of a cloned human gene for apolipoprotein A1 (apoA1) on the dynamics of lipid and lipoprotein exchanges in rabbits in the development of experimental hypercholesterolemia. Implantation leads to the appearance of human apoA1 in the blood of the experimental animals, to a change in cholesterol content, and to a change in the proportions of cholesterol and lipoprotein fractions. The ratio shifts toward high density lipoproteins and high-density cholesterol, both of which hinder atherosclerosis. The highest level of apoA1 is reached after 24 hours. The level decreases after 48 hours, and after 72 hours it is nearly absent. Implantation of human gene apoA1 and its transitory expression had an isolated effect on the system which synthesizes the protein, but also affected the operation of the entire genome via gene regulating mechanisms. Tables 4; references 15: 8 Russian, 7 Western.

Construction of a DNA Probe With Silver Salt. 2. Dyeing of Monomer and ss-DNA

957A0254 Kiev *BIOPOLIMERY I KLETKA* in Russian Vol 10 No 5 Sep-Oct 94 (manuscript received 11 Apr 94) pp 98-104

[Article by M.V. Lichina, A.V. Shugaliy, Institute of Chemical Physics, Russian Academy of Sciences, Chernogolovka; UDC 577.113.4:577.336]

[FBIS Abstract] The formation of a dyed metal complex based on adenine involves successive stages of modification of the formaldehyde base, binding of ethanolamine, and elongation of the side chain by several methoxyl groups. Incubation conditions (solution composition, duration of incubation, pH) and requirements on the level of modification of the DNA probe determine the characteristics of the coloration. Formation of the oligomer chain is dependent on the pH of the solution and the ethanolamine/formaldehyde ratio. Interaction of the metal complex components with free bases in the solution is considered in determining the optimal

method of obtaining a dyed DNA probe. The final metal complex has fluorescent properties that appear only when the formaldehyde chain is completely formed. Coloration appears only after silver is added. Violet coloration develops most quickly in single-stranded DNA. Violet dye has one coordinate bond, orange-red has 4-6 coordinate bonds. While the violet dye is not as intense as the orange-red dye, it takes much less time to develop (orange-red dye takes about a week). A violet coloration can be formed in 3-4 hours at a pH of 8.2. A modification level of 10-15 percent does not prevent the formation of stable duplexes in molecular hybridization. Figures 7; references 6: 3 Russian, 3 Western.

Depression of Cerebral Vasoconstrictor Effects of Malonic Dialdehyde by GABAergic Substances

957A0261A Moscow *EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA* in Russian Vol 57 No 5 Sep-Oct 94 (manuscript received 10 Dec 93) pp 16-17

[Article by S. A. Mirzoyan, V. P. Ako pyan, A. A. Manukyan, Department of Pharmacology, Yerevan Medical Institute; UDC 615.31:547.466.3].015.4.07]

[FBIS Abstract] GABA and its cyclic derivatives, γ -butyrolactone and pyrrolidone-2, nullify and prevent the central (cerebral) vasoconstricting effects of malonic dialdehyde. γ -butyrolactone is more effective than pyrrolidone-2 in this respect. It not only nullified the cerebral vasoconstricting effects of malonic dialdehyde, it also increased local brain blood flow to a level exceeding the initial level without affecting arterial pressure and the frequency of cardiac contractions. GABA itself has the weakest effect. Tables 3; references 11: 6 Russian, 5 Western.

Polyethylene Oxide Correction of Hemodynamic Consequences of Infusion Therapy for Massive Blood Loss

957A0261B Moscow *EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA* in Russian Vol 57 No 5 Sep-Oct 94 (manuscript received 10 Aug 93) pp 25-27

[Article by G. A. Cherny sheva, L. K. Novikova, M. B. Plotnikov, Scientific Research Institute of Pharmacology, Tomsk Science Center, Russian Academy of Medical Sciences, Tomsk; UDC 616-005.1-036.11-092.9-085.381]

[FBIS Abstract] Polyethylene oxides with molecular weights of 4×10^6 and 6×10^6 substantially reduced hypotension (systemic arterial pressure) and cerebral hypoperfusion which developed 0.5-1 hour after the conclusion of infusion therapy with a polyglucine solution for acute massive blood loss. The oxides also substantially increased the rate of turbulent blood flow. The final concentration of polyethylene oxide administered into the blood stream of rats in the study was 10^{-5} g/ml.

A polyethylene oxide with a molecular weight of 2×10^6 was ineffective. In *in vitro* experiments polyethylene oxides had no effect on spontaneous and alclon blue-induced red blood cell aggregation. Figure 1; table 1; references 9 (Russian).

Experience With the Use of a "Jet Scalpel" for Liver Resections

957A0300A Moscow *KHIRURGIYA* in Russian No 11 Nov 94 (manuscript received 6 Jun 94) pp39)

[Article by Prof V.I. Bulynin and Candidates of Medical Sciences Yu. A. Parkhisenko, A.A. Glukhov, B.V. Smolyarov, and V.T. Rogachev, Hospital Surgery Clinic, Voronezh State Medical Institute)]

[FBIS Abstract] Liver resection continues to remain a high risk operation due chiefly to interoperative blood loss. The "jet scalpel" is based on the principle of a needleless injector and makes it possible to obtain a stream of liquid possessing the necessary properties. It allows the vascular/ductal structures to be adequately separated, and this prevents the risk of leaving hepatic areas devoid of blood supply or bile drainage. After preliminary tests on cadavers and dogs, the scalpel was used on 14 patients, six of whom required blood transfusions. Blood loss is reduced from 2200 ml in the control to 670 plus or minus 550 ml, and postoperative complications are reduced. The use of the scalpel is recommended for liver surgery. Research in an analogous direction is being conducted at an oncology hospital in New York and at the First Surgical Clinic of Hokkaido University in Japan. Photograph 1; references: 3 Russian 2 Western.

Research on Interaction Between Radiation of Ho:YAG Laser and Soft Biological Tissues

957A0314A St. Petersburg *PISMA V ZHURNAL TEKHNIЧЕСКОY FIZIKI* in Russian Vol 20 No 15, 12 Aug 94 (manuscript received 11 May 94) pp 50-55

[Article by G. B. Altshuler, A. V. Yerofeyev, I. K. Ilyasov and K. V. Prikhodko]

[FBIS Abstract] Use of the radiation of Ho:YAG lasers (pulse power up to 400 mJ, pulse repetition rate up to 10 Hz) for surgery on soft tissues is discussed. The research involved destruction of model biological tissues by the radiation of such lasers operating in a free generation mode. Destruction was in contact and noncontact variants. The ablation mechanism is discussed and the optimum modes for using a laser scalpel based on use of such a laser are defined. The laser radiation was conveyed to the sample by a quartz-quartz optical fiber. The biological models used were sections of potato tuber and an artificial biological tissue with the end of the fiber being in contact with or at a distance 0.5 mm from the sample. The research findings made it possible to stipulate some requirements on optimum modes for treating soft biological tissues with a Ho:YAG laser. It is evident

that a contact treatment mode ensures the greatest efficiency of destruction with a rate of cutting 2-5 mm/s, with the usually employed frequencies, a pulse repetition rate 5-10 Hz and a mean power 1-2 W. However, these rates do not ensure even edges of the laser wound due to the absence of overlapping of the exposed zones. The wound invasiveness factor is minimum for these rates and can be used in operations on soft biological tissues with a small blood supply. But in operations involving blood losses an Ho laser scalpel cannot ensure reliable hemostasis due to the small zone of coagulation necrosis. A contact mode for performing an operation can therefore be recommended for manipulations not requiring even wound edges and in sectors with a small blood supply, such as operations on the skin and in cosmetic surgery. A noncontact treatment mode for soft tissues results in an even wound edge and a large zone of thermal damage. This mode can therefore be recommended for precise operations under conditions when there is an abundant blood supply. Figures 2; references 7: 3 Russian, 4 Western.

Determining Pain Thresholds With Exposure of Human Skin to Strong Laser Radiation

957A0315A St. Petersburg PISMA V ZHURNAL
TEKHNICHESKOY FIZIKI in Russian Vol 20 No 21,
12 Nov 94 (manuscript received 19 Aug 94) pp 51-55

[Article by A. V. Yerofeyev, I. K. Ilyasov, D. G. Nikolov, K. V. Prikhodko and V. B. Terziyski]

[FBIS Abstract] Although a large literature is devoted to the impact of laser radiation on the body, few studies have dealt with the specific pain thresholds accompanying such irradiation. A Cu laser was therefore used in investigating the pain threshold. For the green line the pain increased gradually and had the nature of external heating, much like when touching a hot object, whereas for the yellow line the pain increased more sharply and had an internal local character (comparable to an injection). The outer side of the forearm was the most sensitive and the least sensitive was the inner side of the palm. It was found that pain thresholds in the case of irradiation of the skin by a Cu laser vary from 11 to 13 J/cm² for the yellow emission line and from 3 to 10 J/cm² for the green emission line. This must be taken into account when treating such skin pathologies as hemangiomas because both these lines are used in dermatology. It is therefore concluded that for continuous and quasicontinuous radiation it is better to use the green spectral region because the pain threshold in this case is considerably higher (the exposure intensity at which pain sensations arise is lower), but the impact on

the blood vessels is comparable to the impact of yellow light (578 nm). Theoretical computations and practical experiments show that with an increase in the diameter of the radiation spot on the object there is an increase in surface temperature and the depth of radiation penetration into the tissue and damage to vessels occurs at a greater depth. A decrease in the threshold energy density of pain sensations with an increase in spot diameter confirms theoretical computations and indicates that when treating vascular pathologies it is necessary to strive for a minimum spot diameter, but such as will ensure the stipulated damage depth. Figures 2; references 9: 1 Russian, 8 Western.

DNA Fingerprinting in Four Cattle Breeds Using (CAC)₃ Microsatellite Probe

957A0316A Tallinn IZVESTIYA AKADEMII NAUK
ESTONII in Russian Vol 43 No 3 Jun-Aug 94 Russian
Vol 20 No 21 12 Nov 94 (manuscript received 7 Apr 94)
pp 113-118

[Article by Terje Raudsepp, Experimental Biology Institute, Estonian Academy of Sciences, Tamar Lushnikova, Chemical Physics and Biophysics Institute, Estonian Academy of Sciences, Nikolai Korokhov, Russian Institute of Animal Physiology, Biochemistry and Nutrition, Borovsk, and Aleksandr Smirnov, Scientific Research Institute of Animal Genetics and Breeding]

[FBIS Abstract] Genetic variations in four cattle breeds (Estonian native cattle, Estonian red cattle, Estonian black-and-white cattle and Bestuzhevskaya cattle from Russia) were evaluated on the basis of hypervariable hybridization patterns. An oligonucleotide (CAC)₃ probe was used in determining genetic variation within and between breeds. A family analysis also was carried out. Within a breed the highest band-sharing value was for the Bestuzhevskaya breed (0.6) and Estonian native cattle (0.5). In Estonian red cattle and Estonian black-and-white cattle the corresponding values were 0.45 and 0.32. This indicates that the Estonian native cattle breed and the Bestuzhevskaya breed display a comparatively limited genetic diversity which may be caused by a high inbreeding level in these local populations. Family analyses revealed Mendelian inheritance of DNA fingerprinting patterns obtained with the (CAC)₃ probe. The interbreed relationships, evaluated by inter-D value comparisons, may determine the genetic distances between the four studied breeds. It is concluded that an oligonucleotide (CAC)₃ probe is more suitable for individual identification, parentage certification and search for hypervariable landmark markers than for distinguishing between different cattle breeds. Figures 4; references: 10 Russian.

Use of High-Intensity Laser Radiation in Operative Thoracoscopy

957A0317A Moscow GRUDNAYA I SERDECHNO-SOSUDISTAYA KHIRURGIYA in Russian No 4
Jul-Aug 94 (manuscript received 23 Sep 93) pp 60-64

[Article by P. P. Shipulin, S. A. Prokhoda, M. A. Potapenko, Yu. G. Tkach and S. D. Polyak, Odessa Oblast Clinical Hospital; UDC 617.541-079.89:615.849.19.03]

[FBIS Abstract] The IR radiation of a neodymium AYG laser makes it possible to perform deep coagulation of tissues and is poorly absorbed by blood, making it indispensable in endoscopic treatment of pulmonary wounds and ruptures. The required radiation dose ranges from 500 to 25,000 J. The contraindications to use of laser procedures in such cases are stipulated. A total of 109 endothoracic laser operations (ETLO) were performed using argon and neodymium AYG lasers on 51 patients with traumatic pneumothorax and on 58 with spontaneous pneumothorax. The parameters, advantages and disadvantages of each type of laser are

discussed. The radiation is conveyed through flexible lightguides, making it possible to direct the ray to the most inaccessible zones of the pleural cavity. Both contact and noncontact treatment variants are discussed. A contact laser scalpel with a special sapphire tip or quartz monofiber is described and its particular applications are discussed. The contactless method has great advantages in treating traumatic pneumothorax (the presence of continuing blood flow from wounds and ruptures of the pulmonary and chest wall is no hindrance to effective photocoagulation). The procedures developed for contact and noncontact laser exposures provided good clinical results in 101 (93.5 percent) patients. The interventions proved to be ineffective in 6 (5.5 percent) cases with spontaneous and in 2 (1.1 percent) with traumatic pneumothorax. The use of a neodymium AYG laser is deemed to be the method of choice in thoracoscopic operations. Improvement of such operations using tele-videoendoscopic systems will make it possible to perform a wide variety of endoscopic interventions. Figures 5; references 6: 5 Russian, 1 Western.

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